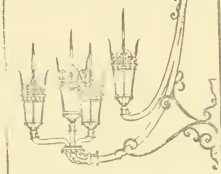


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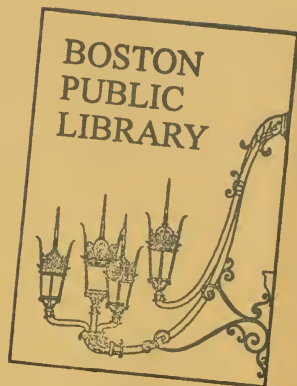
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"HIGH TECH"
FOR
DOWNTOWN BOSTON?



Michael Grill
Gary J. Kleinman
Mary M. Konsoulis
John Whiteman

January 18, 1981

Financing Economic Development
S-581
Belden Hull Daniels

Department of City and
Regional Planning
Harvard University

EBD

958

1981

EXECUTIVE SUMMARY

Chinatown and the South End have the highest local unemployment rates in the Boston SMSA. Should the BRA encourage industrial development in downtown Boston as a public attempt to alleviate that problem? This is the central issue addressed by this paper.

Attracting firms downtown requires an understanding of why firms locate where they do. Firms with established product lines differ from firms with new product lines in their approach to deciding where to locate plants. Firms with established product lines (mature firms), such as Digital and Raytheon, will narrow their choice of sites to a few alternatives by comparing costs, and then encouraging localities to bid for their presence in the community. Firms with new product lines (young firms), such as Teradyne and Wang, will limit their search for new space to a localized area, often choosing their site before bargaining for government subsidies.

In the past, private decisions of firms have left Boston with a dearth of jobs. There are only two practical responses to this situation. One is to move people to jobs; the other is to move jobs to people. City policy, however, is limited to the latter. The BRA's least-cost strategy is to promote downtown as a competitive location for both mature and young firms. However, because locating downtown may require a subsidy, the BRA may, in bargaining with the firm, be forced to offer inducements. We attempt to show how these public monies can be used to the greatest effect, and believe their use is justified given the employment conditions in the downtown area. We do not believe these conditions to be indicative of the failure of the area. On the contrary, we perceive substantial potential for industrial development and would encourage the use of public funds to nurture it.

Downtown Boston can be a competitive location for both mature and young firms that (1) need air or sea transport for their products, and (2) can take advantage of multi-story buildings by having a small or segmented production process. In addition, for mature firms, downtown offers a large pool of technical staff and production workers, especially for the later shifts. For young firms, downtown provides excellent access to Harvard and MIT, the source of many innovative ideas for new products.

We apply our methodology to a specific example, a parcel within the South Station Air Rights Development Project, and find that the site would be an attractive site for mature firms, as well as for Teradyne and Wang. We also recommend an aggressive promotion of downtown Boston to attract firms just starting.

We favor the use of public funds to bring jobs to the city rather than to take people to the jobs for two reasons. First, we believe carefully targeted monies would be successful. Second, the development would bring jobs into established communities, real places. This is a recognition of the fact that people and their families are rooted in a particular place in a way in which other "factors of production" are not.

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1.0 INTRODUCTION

Our sponsors, Chris Carlaw (Coordinator for Non-Residential Development), Matthew Coogan (South Station Project Coordinator), and Lucas DiLeo (Economic Development Analyst), all of the Boston Redevelopment Authority, work on large-scale downtown development projects. In the past, these projects have primarily involved commercial activities (office, hotel, retail). More recently, however, they have begun to work with industrial location and expansion proposals, with firms such as Teradyne, Wang, and New England Nuclear, within the BRA's traditional area of concern, downtown Boston east of Massachusetts Avenue (see Map 1.1).

1.1 Problem

Messrs. Carlaw, Coogan, and DiLeo, have asked us a series of questions about the high technology¹ industry and its appropriateness for downtown Boston. First, they would like to know whether their "conventional wisdoms" about high technology and industrial location theory are accurate. Second, they would like us to apply the results of our research on these topics to a specific case, the South Station Air Rights Development Project.

Specifically, their questions are:

A. General Questions:

1. Do high technology firms meet the economic development goals of the City of Boston?
2. Should the BRA encourage high technology firms to (1) locate and expand in downtown Boston, and (2) locate at BRA-owned or controlled sites in downtown Boston?
3. If high technology firms should be encouraged, how should the BRA try to influence the firm's location choices?

MAP 1.1

High Technology
Downtown

1. Teradyne
2. Wang Laboratories
3. New England Nuclear



4. What types of firms should a high technology strategy focus on?
- B. Specific Questions:
1. Is South Station an appropriate site for a high technology firm?
 2. What must the BRA do to attract high technology firms to South Station?
 3. Regarding the City's economic development goals, what types of high technology firms would be best at South Station?

All these questions reflect some concern for the implications of Boston's recent economic history.

1.2 Response and Conclusions

The implications of location theory for public policy are this: a two stage decision process means that subsidies, tax breaks, etc., can become critical in the final location decision. Towns/cities can easily get caught up in a "bidding war". If they don't join in, they might lose out altogether.

Given the existing legislation that provides Federal money for subsidies, and the current use of tax agreements, we accept these tools of public intervention as inevitable, as part of the scene. What we try to show is how they can be used to greater effect, and to point out some of the problems with the current regulations that govern their use.

Our first conclusion is that by careful factor analysis of the general area, the BRA can identify which firms are best suited to make use of the advantages of a downtown location. But, most importantly, it means that for these firms any necessary subsidy does not have to be as deep as for firms ill-suited for a downtown location. Knowing this allows the BRA to be much more confident when bargaining with prospective firms. Selling the site rather than a subsidy may be just as effective.

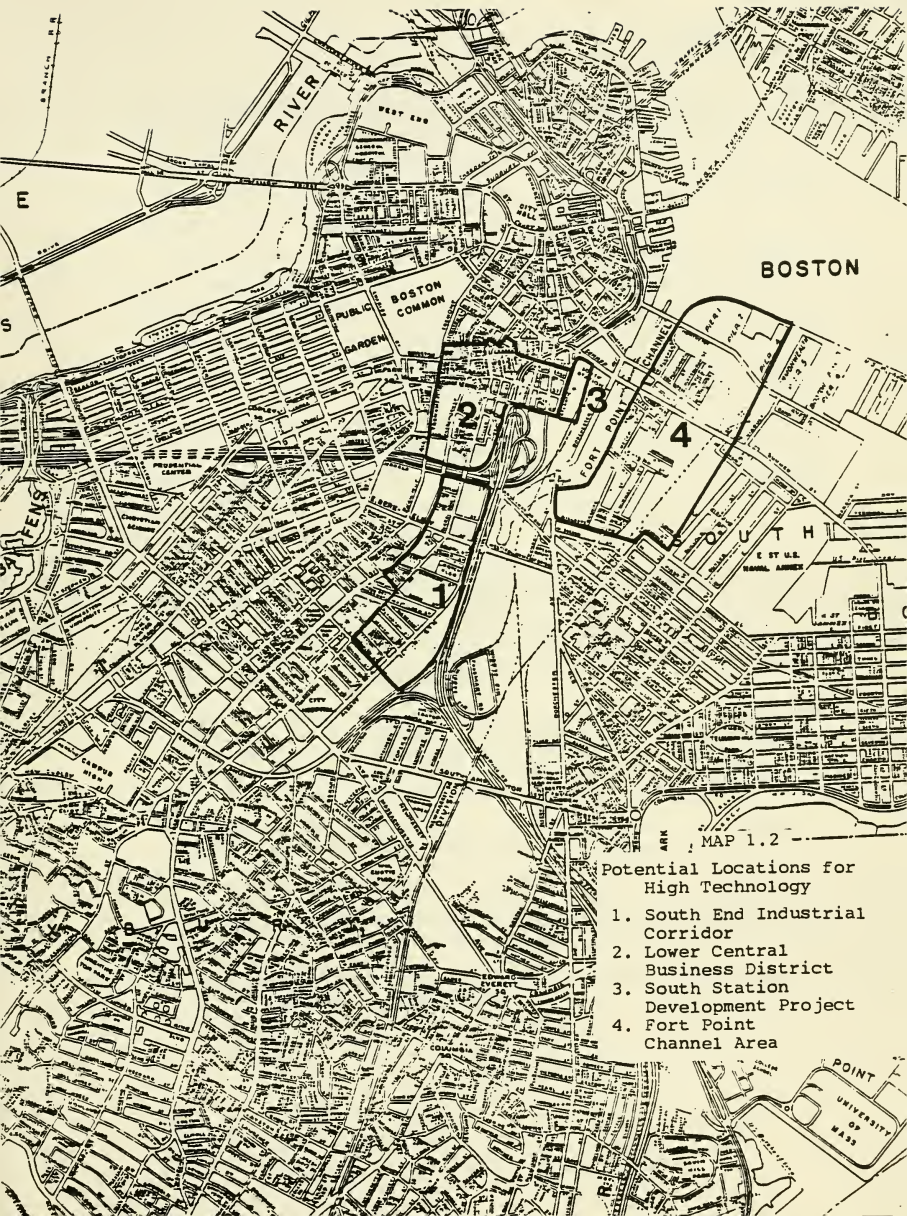
Another implication of this discussion (our second conclusion) is that it is unlikely that those firms that walk through the door of the BRA asking for a UDAG will be the ones that could locate (or expand) downtown with the minimum subsidy. If the BRA really wants to encourage industrial development in downtown, in and around South Station, we strongly advocate a "go getter" policy rather than a "sit back and see who comes" one. From our factor analysis of the area, we set out which firms are most likely to succeed there.

The BRA must adopt two separate policies: one to attract mature firms, and a second "start-up" policy for young firms. The mature firm policy is to seek out firms of a specific type. These firms would (1) require a large pool of technical staff and production workers for their later shifts, (2) need air or sea transport for their products, and (3) be able to take advantage of multi-story buildings. A start-up policy is required because young firms only search for space in the proximity of their origin. To capture the employment growth generated by small firms, a city must have them within its borders in the first place.

Our third conclusion is that with careful public intervention, the strategic promotion of industrial development in the downtown could be very successful. Success will depend in part on the adoption of land policies which allow for the expansion of firms locating there.

We suggest that this can be achieved by insuring a stock of building space. For mature firms, the problem facing the BRA is finding a large enough building in the first place, and insuring that it can meet the firms' future expansion plans. The BRA should work with EDIC to secure an adequate supply of expansion space for mature firms. For young firms, the BRA should either purchase space using their proposed revenue bonding power (see Appendix 11.1), or should encourage community or local development corporations to buy space for start-up firms. The BRA should establish a preferential policy in the Lower Central Business District (CBD), South End Industrial Corridor, and Fort Point Channel Area for light industrial high technology uses (see Map 1.2). The purpose of these policies is to make certain that the jobs which are attracted in downtown Boston stay within the locality.

Finally, we evaluate the use of subsidies to achieve industrial and economic development in a place where it is badly needed. Our conclu-



BOSTON

MAP 1.2

Potential Locations for
High Technology

1. South End Industrial
Corridor
2. Lower Central
Business District
3. South Station
Development Project
4. Fort Point
Channel Area

sions are that the use of subsidies is justified, but we underline the need to target these subsidies to where they will be most effective. We also show how the current IRS regulations governing industrial development bonds (IDBs) can lead to problems with uses of Urban Development Action Grants (UDAGs).

Our analysis is restricted to comparing city with suburb, rather than comparing Boston with, say, Houston or other comparable cities. This means we have restricted our analysis to firms who are likely to have located within the Boston SMSA anyway. We feel that this reflects the nature of the location decision, with mature firms generally narrowing their choices down to several sites in one region, and young firms searching for space in their immediate vicinity. This analysis, therefore, concentrates not on regional disparities in factor costs which would be hard to influence, but on intra-regional disparities, i.e., at the submetro-politan level which the BRA is more capable of influencing.

Our paper is laid out as follows:

- o First, we describe the local history of manufacturing decline and then discuss some recent successes.
- o Second, we analyze existing location theories as a means of describing the framework of private decisions upon which any public policy would have to be superimposed.
- o Third, we analyze in more detail the market implications and supply factors of the area; these include market access (transportation), land, labor, and transportation of raw materials. Throughout this analysis, we are trying to identify the comparative advantages of the downtown area vis-a-vis industrial development.
- o Fourth, we then step back and briefly review why a city would want to intervene in this private location decision.
- o Fifth, we analyze how the city can intervene.
- o Sixth, we apply the methodology for mature firms to a specific case, the South Station Air Rights Development Project.
- o Last, we substantiate our conclusions with interviews of property managers of high technology firms.

2.0 BOSTON'S RECENT ECONOMIC HISTORY

2.1 The Decline of Manufacturing²

Boston's experience with the location of jobs is the mirror image of the experience of its suburbs. Boston has been losing population and manufacturing jobs, leaving behind a mismatch of service jobs (primarily in the finance, insurance, and real estate industries which require high levels of education), and increased concentrations of poor people with manual skills.

The effects of the loss of jobs and the move to specialization has affected the City in the following ways:

- o Boston's unemployment (5.7%, Spring 1980) is concentrated amongst the Black and Hispanic populations. Certain areas with high ethnicity have unemployment rates that are almost twice the SMSA average (South End: 9%, Spring 1980).³
- o Boston's residents are filling fewer and fewer jobs in the City (48% in 1960, 38% in 1977). The growth of the service sector provides jobs mainly to commuters. C n g
- o The low per capita income in Boston is attributable in part to unemployment, but also to the concentration of residents in low wage jobs.
- o This economic decline has taken its toll in housing and neighborhood deterioration. The result is that large segments of land are vacant or underutilized, and await reuse initiatives.
- o The increased demands/needs for public services has contributed to the fiscal plight of the City.

2.2 The Climb Back

Manufacturing firms, specifically Wang Laboratories and Teradyne, have recently become more active in downtown Boston. These firms,

part of Massachusetts' burgeoning "high tech" industry, are leading national and international producers of sophisticated electronic equipment.

Wang's commitment to downtown is concentrated near Chinatown. Working with the Chinese Economic Development Council (CEDC), Wang has agreed to rent 5½ floors of the Boylston Building, located at Washington and Boylston Streets, from CEDC to be used as a light manufacturing plant for Wang Laboratories. A minimum of 250 workers will be employed in manufacturing computer-related products. The workforce will be predominantly Chinese.

The CEDC approached An Wang, president of the rapidly expanding computer firm headquartered in Lowell, Massachusetts, and convinced him that it was his social responsibility to invest in Boston's Chinese community. This is a community where 14% of the available workforce of 5,000 is unemployed. Of those holding jobs, most work in the garment industry or as kitchen help - jobs with low wages and little future.

Wang agreed to rent the Boylston space at \$12 per square foot for five years with four, five year extensions and an option to purchase between the fifth and seventh years. CEDC will rehabilitate the building to Wang's specifications using a package of \$3 million in equity grants from the CSA and the EDA, a \$1 million Industrial Development Bond, and a \$2 million loan from the State Land Bank at 8.5% over 30 years. To encourage this development, the BRA will provide a 121A Tax Agreement to CEDC which will remain in effect if Wang purchases the building and continues light industrial use. In return, Wang will provide English language lessons and technical training for the workers.⁴

Teradyne, maker of electronic test equipment sold world-wide, started in Boston's financial district in 1960 and has chosen to remain a Boston-based firm because of the City's proximity to transportation and amenities. It already operates two plants in downtown's Leather District with a third facility at the Hub Mail Building in the South End coming on line as building renovations are completed. The Boston operations are the largest of Teradyne's five locations across the United States. Teradyne employs 1,375 workers in Boston, 435 of whom are Boston residents, at an average salary of \$17,000.

Teradyne, whose average testing system costs in excess of \$100,000, serves a variety of customers including the semi-conductor, office products,

computer, and automobile industries. This firm, with revenues in 1979 of \$122 million and a projected growth rate of 25% over the next five years, has been able to accomplish its most recent expansion at the Hub Mail Building through the aid of a UDAG obtained by the BRA. The UDAG project will enable Teradyne to rehabilitate the Hub Mail Building, acquire adjacent land for parking and future expansion, lease parking lots near the downtown operations, and improve facilities at the other two downtown plants. Once completed, the project should add 2,000 jobs to the Boston economy.⁵

3.0 LOCATION THEORY AND FACTOR ANALYSIS

3.1 Location Theory

Recent research at MIT (Birch 1979) tell us which firms we can expect to be making location decisions. These decisions are made by firms that are branching and by firms that are expanding. Firms, however, almost never move entirely to another region. In terms of jobs, he finds that half of all new jobs are created by young firms and that the other half are created by the branching of mature firms.⁶

The location decision of both mature and young firms are two stage processes. The first stage involves the search for space. The second stage is a process of bargaining with jurisdictions for any available subsidies or grants.

Young firms, when searching for space, employ a "limited search" strategy, that is, they only consider sites close to where the firm happened to have started. Their search is driven by immediate need for expansion space. If nearby space is unavailable, the scope of the search is gradually widened until space is found. As a consequence, young firms have often already chosen a site before approaching local governments for subsidies. (See Appendix V for detailed examples of limited search strategies.)

For mature firms, the first stage involves a comparison of market implications and factor costs (land, labor, transportation, supplies, etc.), of possible sites in many regions. The firm satisfies itself that it would have a reliable and affordable supply of all its needs and that it can get its product to market at a competitive price. Typically, this first stage does not yield a unique solution, i.e., there is rarely one "best site". More typically, the firm narrows its range of choice down to a few alternatives (generally within the same region) and to which it is largely indifferent. The second stage of the decision is then a choice between comparables. The criteria which usually dominates this choice are not those that dominate the first stage. It is at this stage that items like subsidies, personal taxes, and "quality of life" factors may become critical. And it is at this stage that a choice of where within the region to locate is made.

For all firms, the first stage of the location decision must involve an analysis of the cost and availability of factors of production at the location.

3.2 Factor Analysis

In this section, we analyze in more detail the factors affecting a firm's cost structure, and its access to national markets, that influence a location decision. We assume a market for high technology products that is at least regional, if not national or international. The problem on the demand side becomes one of access to markets - a problem of transportation, essentially.

On the supply side, we investigate closely only those factors of production which would influence a choice between a city and a suburban location - land, labor, transportation, etc. We don't evaluate the cost of availability of capital, pertinent though it is to economic development. This is because we could not envisage any reason why the cost or availability of capital to the type of firms that we are considering in this part of Boston should vary vis-a-vis a suburban location. We, therefore, could not see how differences in the supply of capital between two such places could influence a location decision. This is not to deny the importance of capital encouraging certain kinds of economic development (especially small business), nor to deny the important role it could play in a total coordinated development effort for this area. We merely wish to limit our discussion to those things which are directly relevant or which the BRA might be able to influence. As a consequence, we do not discuss the cost of energy, either.

3.2a Land and Buildings

As with any factor of production, cost and availability are the two key issues. In this section, we show that for industrial property in and around Boston, the difference in cost between city and suburb is minimal - certainly not big enough to become a major determinant of the location decision. Of much greater concern is the issue of availability - especially room for expansion. We examine the situation downtown and conclude that, although space is available at the South Station development parcel for mature firms, expansion space, whether for mature or for young firms, is scarce. The successful creation of employment will depend on public policy to overcome this problem.

Cost

For a firm that can use multi-story buildings in its production process, the cost of land and a new building in a downtown location could be equal to the cost in the suburbs. A downtown two-story plant, which is close to mass transit, could be built without also buying land for parking and landscaping. Also, the two-story plant would use half the land of a one-story plant. From Table 3.1, we can see that the total development costs of a suburban plant could be equal to the total development costs of a downtown plant, if suburban land sold for \$1.80/square foot and downtown land sold for \$12.50/square foot.

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TABLE 3.1
CITY/SUBURB COST DIFFERENTIAL⁷

	<u>City</u>	<u>Suburb</u>
<u>Building Assumptions</u>		
1. Plant gross square footage	250,000	250,000
2. Space efficiency	92%	92%
3. Plant net square footage	230,000	230,000
4. Building footprint (sq.ft.)	125,000	125,000
<u>Parking Assumptions</u>		
1. Median density (sq.ft./worker)	137.5	137.5
2. Number of workers	1,673	1,673
3. Workers per space	--	--
4. Spaces required	--	1.7
5. Total parking square footage	0	295,200
<u>Land Assumptions</u>		
1. Building footprint (sq.ft.)	125,000	250,000
2. Parking square footage	0	295,200
3. Landscaping square footage	0	40,300
4. Total square footage	125,000	585,500
<u>Cost Assumptions</u>		
1. Development Costs (Building)	\$40/sq.ft.	\$40/sq.ft.
2. Parking Costs	0	\$500/space
3. Land Costs (improved)	\$12.37/sq.ft. (say, \$12.50)	\$1.80/sq.ft.
<u>Total Development Costs</u>		
1. Building Costs	\$10,000,000	\$10,000,000
2. Parking Costs	0	492,000
3. Land Costs	1,545,900	1,053,900
Total	\$11,545,900	\$11,545,900

Comparing costs of a renovated downtown building to a suburban plant also shows that a downtown location can be competitive.

TABLE 3.2
RENOVATED BUILDING/SUBURBAN PLANT COST DIFFERENCE⁸

<u>City</u>		<u>Suburbs</u>	
Renovation Costs (220,000 g.s.f.)	\$ 8,376,800	Construction Costs (300,000 g.s.f.)	\$11,916,684
Professional Fees	1,196,056	Land	1,200,000
Site & Parking Improvements	317,000	Equipment	<u>17,284,000</u>
Building & Land Acquisition (P.V.)	2,386,945		
Equipment	<u>12,674,933</u>		
Total:	<u>\$24,951,734</u>	Total:	\$32,532,431
Cost per gross square foot:	\$113.42		\$108.44

Although the City location costs are 4.6% greater per square foot than the suburban location, a firm would locate downtown to minimize other costs, such as transportation, as well as to maximize access to labor and innovative ideas.

The difference between city and suburban location is also described in the following table with data from a survey by the Society of Industrial Realtors.

TABLE 3.3
PRIME INDUSTRIAL BUILDINGS: BOSTON METRO AREA⁹

	<u>City</u>	<u>Suburbs</u>
Construction Costs:		
100,000 sq.ft. or more	\$25/sq.ft.	\$25/sq.ft.
less than 100,000 sq.ft.	\$40/sq.ft.	\$40/sq.ft.
Land Costs:		
Improved	\$2.00/sq.ft.	\$1.50/sq.ft.
Unimproved	--	\$0.25/sq.ft.
Sales Prices: Buildings	\$10/sq.ft. for more than 60,000 sq.ft. \$20/sq.ft. for less than 60,000 sq.ft.	\$20/sq.ft. for more than 100,000 sq.ft. \$40/sq.ft. for less than 100,000 sq.ft.
Lease prices:	\$5-7/sq.ft.	\$4-7 sq.ft.

Availability

Far more crucial than cost in a downtown location decision is the availability of suitable land and buildings for high technology firms, especially land for expansion.

In downtown Boston, four locations¹⁰ within the BRA's area of concern would be suitable for high technology firms: (1) the South End Industrial Corridor; (2) the Fort Point Channel Area; (3) the Lower Central Business District (the Theater District, the Garment District, Chinatown, New England Medical Center/Tufts, the Combat Zone, the Leather District) (see Map 3.1), and (4) the South Station Development Project (see Map 1.2).

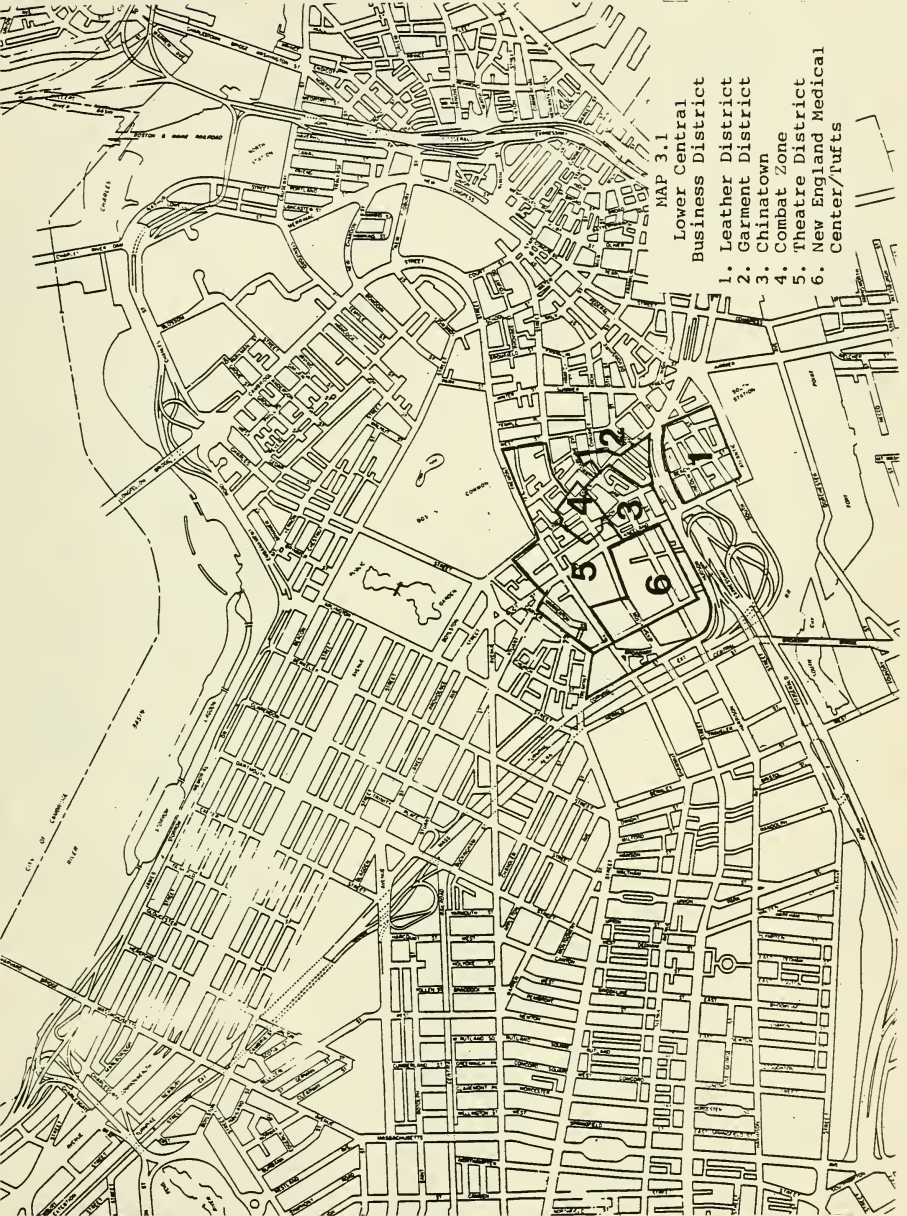
Although these locations are primarily zoned for manufacturing uses, some areas are zoned for business uses (see Map 3.2). Zoning changes would be necessary in these areas (see Appendix II.4).

In the past, rapidly growing firms have purchased 30 to 100 acres in the suburbs to ensure room for expansion. But today, large suburban parcels are becoming scarcer for firms seeking to locate or expand around Route 128 and Interstate 495. These firms will begin looking for smaller parcels in their locations and eventually beyond 495 as well as in Boston.

EDIC is preparing for when high technology firms come to Boston with three existing industrial parks, the Boston Marine Industrial Park (102 acres) in South Boston, the Crosstown Industrial Park (38 acres) in Roxbury, and the Alsen-Mapes Industrial Park (7½ acres) in Dorchester. Two other industrial areas are planned at the old Boston Army Base (a BMIP expansion) and on the Boston State Hospital grounds (see Map 3.3).

Downtown Boston with many locational advantages over EDIC's industrial parks¹¹, but has very few parcels (excepting the South Station Parcel) available for high technology uses.

According to Charles Studen, the BRA South End Project Coordinator, few parcels in the Industrial Corridor are vacant. And New England Nuclear, a high technology firm (see New England Nuclear Interview, P.36), has proposed an expansion onto some of the remaining parcels.

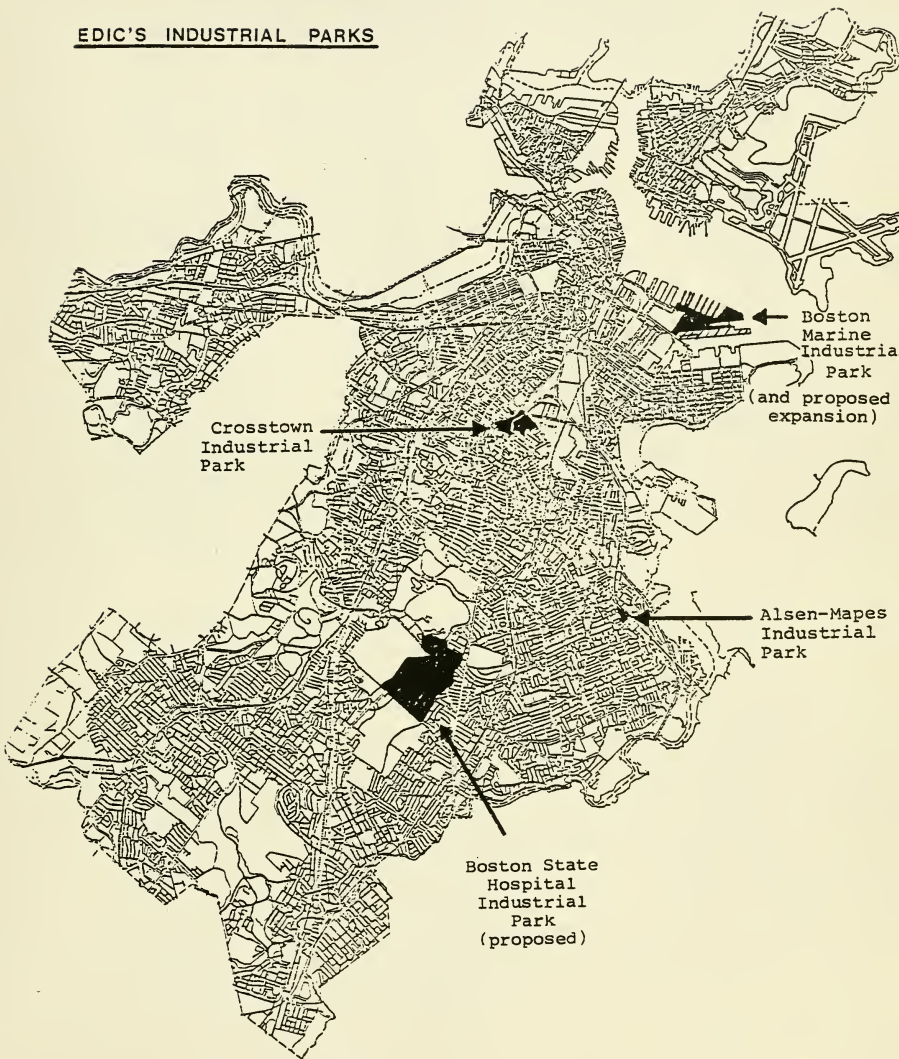


MAP 3.1

- Lower Central
- Business District
- 1. Leather District
- 2. Garment District
- 3. Chinatown
- 4. Combat Zone
- 5. Theatre District
- 6. New England Medical Center/Tufts

MAP 3.3

EDIC'S INDUSTRIAL PARKS



In the Fort Point Channel Area, large parcels do exist, but their owners are speculating that downtown, and thus commercial uses, will expand into the area. The BRA Fort Point Channel Project Coordinator, Matthew Coogan, reports that the City favors a variety of uses for the area, such as offices, housing, hotels and waterfront recreation. High technology facilities would disrupt these future plans (see Map 3.4).

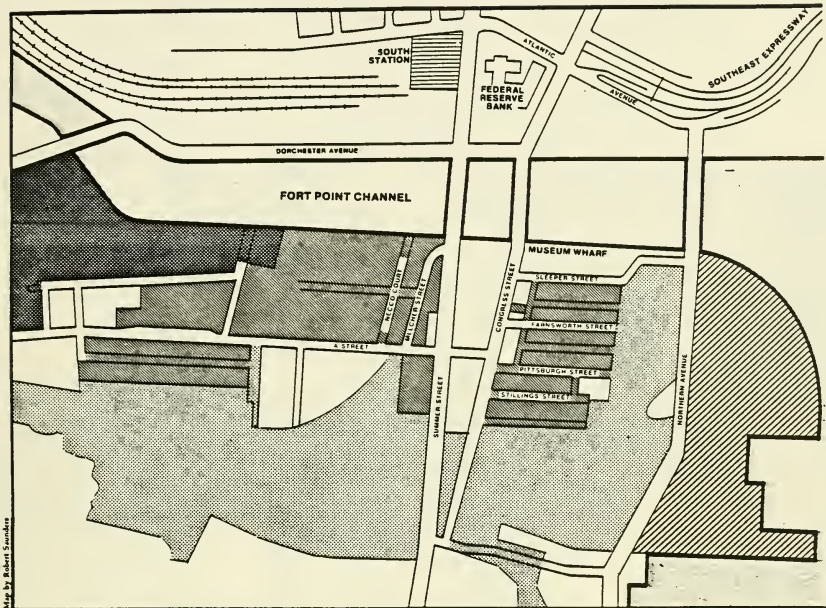
The BRA is also encouraging mixed-uses in the Lower CBD. This diverse area already has many uses, such as theaters, retail, housing, offices, schools, medical facilities, as well as Teradyne and the proposed Wang facility. Although few parcels are available for new development, many office-warehouse buildings have high vacancy rates. (See Map 3.5.)

Of the four possible locations, only the South Station development parcel can currently be proposed for high technology uses. When other suitable sites and buildings become available, the BRA should encourage high technology uses. Inventories of vacant space, already started in the South End Industrial Corridor, should be begun immediately in the other areas.¹²

3.2b Labor

In this section, the availability of an adequate labor supply for a downtown high technology firm is examined. It appears that there should be no significant problem for a firm to meet its labor requirements. Further, there should also be no significant difference in the availability of employees for a high technology firm locating in Boston as compared to locating in the suburbs.¹³ We are unable to give precise estimates of how the total wage bill will be affected between the two locations. The issue is too complicated. The evaluation of wages, fringe benefits, and layoff responses to cyclical demand all affect the total wage bill. The high variability of the behavior of firms in this regard prohibits a reliable analysis before the fact. In addition, wages are not only set in response to marginal productivity. There is a whole social process, both internal to the firm and relative to similar employees in the area, which comes into play. Therefore, the issue of price of labor is tackled in qualitative terms.

MAP 3.4 FORT POINT CHANNEL AREA



Map by Robert Saunders

Who owns Fort Point?

Owned by Penn Central. Although a substantial amount of the property (about 17 acres) has been reserved for use by Conrail, the remaining large tracts will be in the hands of developers soon. Penn Central has already signed a purchase agreement with Broderick Properties Inc. for 24.5 acres, which will probably end up as an office park, and also has a pending agreement with an as-yet-unnamed firm for the remaining 0.9 acres.

Owned by the Boston Wharf Company. In the next few years, the area off Congress Street, mostly warehouses, will be the site of an 88-unit condominium development. If the conversion is successful, expect more of the same in the surrounding land. The area to the south, between Summer Street and the Channel itself, was originally slated for a convention center/arena. Lately, because of various city ordinances, this hasn't looked too likely. If it falls through, there will probably be more housing developments, capitalizing on the waterfront view.

Owned by Anthony Athanas. Proprietor of Pier 4. Big plans for this area: a 600- to 1000-room hotel, up to 1000 housing units, an office complex, restaurants, a marina, commercial property, and parking. Before any of this begins, however, Athanas has to find a developer who shares his dream, and the Northern Avenue Bridge has to be substantially improved.

South Station. The MBTA promises to put \$200 million into this shell and turn it into the South Station Transportation Center, the keystone of the federal Northeast Corridor Rail Project. By the mid 80s, this area should look like an airline terminal, with high-speed train, a new bus station, multi-level parking and private development.

Owned by the Gillette Company. Most of the area already consists of modern industrial facilities. This is the way Gillette likes it; no changes planned.

SOURCE: "Fort Point Counterpoint", D.C. Denison, Boston Phoenix, September 16, 1980, P. 6



MAP 3.5.
Lower Central
Business District

1. Leather District
2. Garment District
3. Chinatown
4. Combat Zone
5. Theatre District
6. New England Medical
Center/Tufts

High technology firms in the suburbs like to employ housewives as production workers. This brings the firms savings in terms of fringe benefits, tenure expenses, and staffing for second shifts. Because average wages are so low in the South End, and in Chinatown (between \$5,000-\$7,000/year), and because unemployment is so high, we feel that any firm locating downtown will have a cheap supply of labor which is competitive with that in the suburbs. Wages for other skill levels will be comparable between the two location choices, since the market for these higher skill jobs operates at a regional or national level. Thus, the crucial aspect of labor is its availability and its skill. This report, therefore, breaks the employment structure of a high technology firm into three skill categories, and examines each with respect to adequacy of future supply in the face of expected future demands. Additionally, the comparative advantages between the two locations (suburb/Boston) for providing an adequate supply is also evaluated.

Future High Technology Labor Demands

Massachusetts high technology has grown 98% over the last twenty years. Within the industry itself, there was considerable growth differentials. Computers grew 1484%, photographic equipment 392%, components 371%, instruments 153%, guided missile systems 54%, and communication equipment 21%. Projected employment growth by 1983 in the Boston SMSA in high technology should be responsible for approximately 113,000 total jobs, an increase of 15,300 new jobs (see Table 3.4).

TABLE 3.4

Boston SMSA (1983) - Projected Labor Needs in High Technology

Computers (SIC 357)	21270	CHANGE:	3850
Communications (SIC 366)	23210		3200
Electronic Components (367)	23630		1960
Controlling/Measuring (382)	18580		1400
Photographic Equipment (386)	26560		5100
TOTAL:	113250		15510

Source: TMA High Technology Enterprise in Massachusetts, October, 1979.

Given these projected demands for high technology labor, and taking the Boston SMSA perspective, will there be enough people with the right skills to fill these jobs? The conclusion here is that there will indeed be an adequate labor force for high technology available, and there should be no real difference in available supply between a downtown or suburban location.

Top Skill Positions

The top skill level in high technology's labor structure is the "Professional/ College Degree" level (management¹⁴ and senior engineers). This category accounts for about 15% of employment for the average firm. Boston SMSA will thus need 16,900 people by 1983, or 2,300 new positions. It seems reasonable that this level of suitable employees will be available in the Boston area, given the professional schools in the region. It also seems reasonable that the suburban areas will have no greater advantage in recruiting this type of employee, nor any particular ability to withhold an adequate supply from reaching downtown firms. Current commuting patterns attest to the intra-metropolitan mobility of these people.

Middle Skill Positions

High technology's middle skill level consists of two sub-levels: "Junior and Entry-Level Engineers, and "Paraprofessionals" (technicians/ Associate Degrees). The "Junior and Entry-Level Engineers" is about 12% of a firm's job structure, and will need approximately 3,000 employees by 1983. These people are typically recent graduates from engineering schools. The current publicized concern over future shortages of this type of employee is based on the slow growth in the number of graduates from the state's educational institutions being outstripped by the high future demand. However, the questions here pertains to the local area perspective, not the statewide. Two reasons point to the conclusion that downtown Boston won't be in a disadvantaged position when compared to the suburbs when recruiting this skill group of employees. First,

Boston's universities produced over 64% of the state's engineering degrees (1976), thus producing a sizeable number within its immediate boundaries. Second, a suburban firm should not be any more attractive than a Boston firm in attracting employees, given current commuting patterns.

The other sub-level, "Paraprofessionals" makes up 13% of a high technology's firm job structure. By 1983, this will mean 2,000 more "Paraprofessionals" needed in the Boston area. Although unsure about statewide supply, the Boston region should have adequate people of this skill level. The Public Vocational Education System has increased the number of individuals receiving training in high technology-related occupations to 24,267 enrollees in 1979.¹⁵ In 1980, 39 high technology related vocational programs have been funded (\$1.4 million), Boston receiving the largest share (49%).¹⁶ Additionally, the Boston area trains approximately 700 people in high technology-related programs sponsored by two community colleges, the Technical Assistance Training Corporation, and the EDIC Computer Training Program. The most recent census data also shows that 68.4% of Boston residents either meet or exceed the minimum standards of acceptance for most technical training programs. Downtown Boston would appear to be in an equal, if not superior position to the suburbs, to adequately supply high technology's future employment demands of this skill level.

Production-Level Position

The "Production" skill level (Skilled/Semi-skilled/Unskilled) comprises 60% of the high technology labor structure, meaning about 8,600 new jobs by 1983. The high unemployment in downtown Boston¹⁷ would indicate a large supply of people who need work, and would be able to fill the positions high technology could generate in the area. These persons should be considered readily employable. More importantly, this skill level and these people are the prime targets of Boston's economic development goals. Thus, the labor supply for high technology's growing needs will be at least as good in the city as in the suburbs.

3.2 c Transportation

Access and Implications

Downtown Boston has excellent access to air, water, and truck transportation networks. The two harbor tunnels provide direct links to Logan Airport, lowering time and costs of getting products to their carriers. Boston also has good access to rail and shipping facilities. Although these modes of transport have experienced recent decline in Boston, they still remain vital methods to all coastal and international ports.¹⁸ The downtown location also has quick access to the highways. Although suburban areas usually have the same quality of access to the roads, the relative advantage in motor transportation should be considered equal between the suburbs and the city.

The transportation advantages of the City holds several implications for the types of firms which would best be suited to a Boston location. First, a firm that exports internationally could very well exploit the air and shipping facilities. For example, Teradyne has a very active domestic market, but it also needs access to its international buyers. Air transport best serves this need. Second, firms that produce large, bulky, fragile items are better suited to this area's transport linkages. For example, electronic assemblages. This type of product requires special handling that may be beyond the abilities of trucking services. Additionally, the costs for air transport are probably lower for output low in number, but high in bulk. Third, firms whose inputs are more economically transported by air or water may be better off downtown. Although many such inputs are small enough to be trucked in, highway access must be considered neutral in most cases.

The main point remains, however, that the types of transportation available to the downtown location for high technology firms should be viewed as equally competitive to a suburban site, especially if a firm needs quick access to ship and air transport.

3.2d Innovations, Services, Amenities

The analysis of the various factors of production has so far been limited to the traditional concerns of business (cost and availability of land, labor, transportation). However, discussion of other elements is necessary, such as access to innovative ideas for products, needed services of firms, and "human factors". Although difficult to quantify for evaluative purposes, these elements often become crucial to an accurate comparison of city versus suburb advantages/disadvantages.

High technology firms have a relatively short product-life cycle. A new product line soon becomes outmoded in this fast-paced industry. Therefore, a premium is placed on having access to the latest innovations and technological breakthroughs. Without access to "ideas", a firm loses ground to competitors. Typically, there would be a freer exchange of ideas in the educational environment. The innovation producing atmosphere of MIT, Northeastern, Tufts, Harvard, and Boston Universities are just such examples. Thus, a private firm's research and development department can be more easily kept on the cutting edge of product innovation through linkages between these educational institutions. The downtown Boston area argues this case of ease of information availability, since geographic proximity exists. More importantly, mass transit offers the convenience of being a few, quick stops away.¹⁹

Downtown Boston also offers a variety of services which may have to be provided at cost at a suburban location. Although suburban bank branches are plentiful, the downtown home office may offer a more complete range of financial services. The fees for transactions charged to a firm may thus be lower in the city. A downtown location could potentially save the firm the cost of providing cafeteria services for its employees. This may be more a function of the actual location in the suburbs: an extreme outlying site would almost certainly call for on-site food service. Downtown, on the other hand, has an ample supply of restaurants, leaving the choice to the firm. A suburban location may eliminate this option entirely.

The "human factor" typically enters the location analysis at the upper end of the management hierarchy. Recent literature has made an emphatic point of examining the upper echelon's personal desires and/or likings. Specifically, Teradyne's president reportedly enjoys walking from his Beacon Hill residence to his plant, thus helping keep Teradyne in Boston. An Wang's recent decision to open a branch plant in Chinatown may be, in part, caused by a strong desire to help the economic plight of Chinatown's residents. Orion's president lives in Cambridge and wants his firm in Cambridge. Admittedly, the love of city may be balanced by the love of country (or hate of the city) when examining a large range of location choices. The point here is that the downtown Boston site does have other advantages which may help balance its disadvantages, or help cancel suburban advantages: all factors should be evaluated.

3.2e Factor Analysis Conclusions

The analysis shows that downtown can be competitive with the suburbs as a location for industrial activity. The breadth of the city's advantages depends mostly on the type of firm that will locate there, the right firms being able to maximize the area's advantages. More specifically, these firms will be:

- o firms that need air or sea transport for their products.
- o firms that can take advantage of multi-story buildings by having a segmented or small production process.
- o mature firms that require a large pool of technical staff and production workers, especially for the later shifts.
- o young firms that require access to innovative ideas from Harvard and MIT.

4.0 RATIONALE FOR PUBLIC INTERVENTION IN PRIVATE LOCATION DECISIONS

The preceding section has analyzed the costs of doing business downtown versus a suburban location. So far we have only considered this from the perspective of the private firm. In this section we step back and review the reasons why a city government may want to intervene in this private decision. In the next section we discuss how they should intervene.

The private firm chooses a location which combines the least cost of production with a maximum ability to sell its product. The main driving motives of the firm are a desire to stay in business and if possible to expand (i.e., to maximize its sales volume), and a desire to maximize profit. We have shown that the suburban location is not superior in all cases to a location downtown. And yet, despite this, industrial development is lacking in the area. While perfectly legal, the private decision does not address some essential questions of public policy. Government has public goals legitimated through the political process, and the divergence between these goals and the goals of the private firm provides the rationale for public intervention.

Boston has defined the following public goals for its economic development:

1. to increase the number and quality of jobs for Boston residents in order to reduce unemployment and to increase real income.
2. to induce and encourage the growth and diversification of Boston's economic base.
3. to strengthen the city's tax base.
4. to promote and preserve the stability of neighborhoods as places to live and do business.
5. to minimize the effects of high energy costs.
6. to target infrastructure improvements to areas of greatest potential.
(from Comprehensive Economic Development Strategy (CEDS),
City of Boston, FY81)

These goals are a recognition of the fact that private decisions of where to locate firms leave certain groups of people without jobs. This "market failure" has found political expression, putting pressure on government to correct this situation.

FIRST SOURCE AGREEMENT

In an effort to maximize the employment opportunities for Boston residents, especially the economically disadvantaged, the City of Boston and Teradyne, Inc. agree to the following. The goal of this agreement is to employ Boston residents in 50% of the newly created jobs at Teradyne.

1. Employment on all construction funded wholly or in part by an Urban Development Action Grant secured by the City for this project will meet the Mayor's Executive Order on construction employment.
2. Construction funded wholly or in part by an Urban Development Action Grant secured by the City for this project will meet the Mayor's Executive Order for Minority Business Utilization, effective July 1, 1978.
3. A minimum of 15% of the jobs created by the project in occupational categories for which EEPA has the capacity to provide referrals will be reserved for economically disadvantaged Boston residents.
4. Teradyne will provide the City of Boston ten working days to refer Boston residents to jobs in all mutually agreed upon occupational categories, before using other employment sources, during the length of the UDAG loan payback period.
5. Teradyne will provide the City a quarterly report on the number of Boston residents employed in the newly created jobs through June, 1985, and annually thereafter. These reports will include the names and addresses of those individuals referred by EEPA. The reports will begin six months after the renovation of the facility is complete, and continue until the UDAG loan payback is complete.
6. The Boston Private Industry Council will work with Teradyne to secure Targeted Jobs Tax Credits for all positions filled by eligible individuals. The BPIC will also inform Teradyne of other Federal initiatives that can benefit the company.

CITY OF BOSTON
OFFICE OF THE MAYOR
CITY HALL, BOSTON



KEVIN H. WHITE
MAYOR

BOSTON PUBLIC LIBRARY

EXECUTIVE ORDER

WHEREAS there is a very high rate of unemployment in the City of Boston, particularly among the youth of the City, both white and minority;

WHEREAS the effect of this high level of unemployment has a serious, substantial and deleterious effect for all the neighborhoods of the City of Boston, resulting in the physical deterioration of the neighborhoods, vandalism, and crime;

WHEREAS there is a particularly high rate of unemployment and underemployment for Boston residents who have worked or seek work in the construction industry;

WHEREAS the City of Boston expends substantial sums of money derived from federal, state and city taxes paid by Boston residents upon public works projects in the in the City, hence City residents are entitled to receive some direct benefit from such expenditures;

WHEREAS in addition to the foregoing, the City is intent on satisfying its statutory obligation to give preference to its residents in hiring for publically funded construction projects pursuant to G. L. c. 149, §26.

THEREFORE, I do hereby order that the following policy take effect as of October 15, 1979:

(1) On any construction project funded in whole or in part by City funds, or funds which, in accordance with a federal grant or otherwise, the City expends or administers, and to which the City is a signatory to the construction contract, the worker hours on a craft-by-craft basis shall be performed, in accordance with the contract documents established herewith, as follows:

- a. at least 50% by bona fide Boston residents;
- b. at least 25% by minorities;
- c. at least 10% by women.

EXHIBIT 4.2 (cont'd)

For purposes of this paragraph worker hours shall include work performed by persons filling apprenticeship and on-the-job training positions.

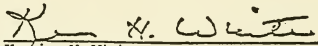
(2) Each department of the City of Boston contracting with any private corporation or person for such construction projects, shall include in all such contracts the provisions of the City of Boston Supplemental Minority Participation and Residents Preference Section to insure compliance with this Executive Order.

(3) The Equal Employment Opportunity Contract Compliance Office of the City of Boston through the Awarding Authority shall be responsible for monitoring and enforcing the provisions of this Executive Order and the contract provisions established in accordance therewith.

(4) I urge the Boston Redevelopment Authority and the Economic Development and Industrial Corporation to incorporate the provisions of this policy into all the contracts for construction projects to which they fund or administer, and to which, in their capacity as owners are signatories.

(5) I direct the Vice-Mayor, the Corporation Counsel, the Assessor, and request the BRA staff to research the legal feasibility of the incorporation of this policy into the General Laws Chapter 121A process and if found to be legally feasible, I will incorporate this policy into that process and any other tax related development incentive process.

(6) I am filing today with the City Council a proposed ordinance which will punish those people who would misrepresent facts about themselves in order to become beneficiaries of this program.


Kevin H. White
Mayor

September 11, 1979

Date:

Although inherently difficult to quantify, the multiplier effects of job generation deserves discussion. Multiplier effects refer to the added economic activity induced by the spending of the new incomes created by employment. People who have jobs spend some of the income earned on goods and services in the local area; the more jobs created, the more is spent and the greater the amount of economic activity thereby created. Although a state multiplier was estimated by Harrison and Kanter at 1.2-1.5 for Massachusetts, a local multiplier is much more difficult to determine. However, it appears reasonable that residents of culturally homogeneous communities would tend to consume more goods and services within their own communities, implying that communities like Chinatown may have relatively high multipliers. Leakages to other economies would therefore be relatively small for such communities. Thus, job generation as a means of promoting economic development would seem to be well targeted in these communities.

5.0 IMPLEMENTATION

As a development agency, the BRA is primarily concerned with facilitating physical improvements. Which particular developments they tackle is really a broader question that is controlled by City politics and also the circumstances of the moment. The history of the BRA activities (in the past, it has mainly dealt with commercial and housing projects) has given it a familiarity and expertise in dealing with certain kinds of programs aimed at encouraging development. Specifically, these are public relations (promotion), Urban Development Action Grants (UDAG) , and other non-City funded sources, Industrial Development Bonds (IDB), and Chapter 121A Tax Agreements. All of these are ways for the BRA, a public body, to intervene in a private location decision, and many of these tools involve subsidizing the cost of location to a firm.

Our analysis of the location decision as a two stage process puts the BRA in a difficult position regarding subsidies. We see the second stage essentially as a bargaining process and so it is very unlikely that the BRA will have at its disposal all the information necessary to estimate the "correct" amount of the subsidy. This is for two reasons. First, despite the strict legal requirements that balance sheets and income statements should substantiate the application for a grant/subsidy, it must be recognized that the firm has a strong incentive to overstate its case. Second, it is more than probable that a firm will not know its cost structure in advance of locating on a new site. Consequently, calculating subsidies is not an exact science. The bargaining process is the only way the BRA can hope to approach the "right" figure.

An understanding of how each factor of production is affected by the very specific geographical and economic context can give the BRA confidence in its own bargaining position. Specifically, evaluating the area will help identify the kinds of firms that can locate downtown with the minimum of subsidies. This is very important because even though day to day pressures and political pressures may seem to deny it, the BRA does have some measure of choice in who it bargains with. By identifying firms that provide the kinds of jobs needed downtown, firms that meet the City's other development goals, and that are best suited to locate here, the BRA can be more confident of adopting a "tougher" stance in its bargaining position and still succeed in

attracting the firm. Subsidies are "scarce commodities", and the continued existence of many subsidy programs will, in the long run, depend on how effectively they are used.

But, even before any public money is spent, the BRA has one option which, even if not successful on its own, will increase the effective use of public funds. This is to adopt an aggressive promotion program; to seek out, advertise for, and collect names of and information on mature firms to contact (as well as informing young start-up firms, or engineers deciding where to locate their new firms), that downtown Boston can be a competitive location.

From this promotion, the BRA can identify firms that it wants to locate downtown. Inducements, in the form of the above-mentioned programs, may then be necessary for bidding against competing jurisdictions. If the BRA has correctly identified firms that can take advantage of a downtown location, only minimal inducements should be required.

In Appendix II, we have described various public sector programs that could be used to attract high technology uses to downtown. From a national perspective, the programs with the greatest cost are Urban Development Action Grants²⁰ (see Appendix II.2) and Industrial Development Bonds (see Appendix II.3), as they require large Federal outlays or forgone Federal tax revenues, respectively. To the BRA, however, the most costly current program is the Chapter 121A Tax Agreement which has the effect of foregoing City property tax revenues. Even though both Teradyne and Wang have recently received a 121A Agreement, few non-residential corporations in Boston have used this program. (See Appendix II.5.)

With all three programs, the BRA has incentives to be selective in their use. Misuse of UDAGs and IDBs could lead to new Congressional restrictions if cities use the programs as bargaining chips to induce firms to locate in their jurisdiction. And in the Boston region, overuse of IDBs could lead to a saturation of the tax-exempt market causing interest costs on municipal borrowing to increase.

If promotion is ineffective in attracting young firms to downtown, a higher cost alternative of purchasing buildings for high technology rental space should be pursued. Although the BRA does not currently have the power to purchase buildings with revenue bonds, this power is expected within the year. (See Appendix II.1.) Rental space in older downtown

buildings would be subsidized to qualifying start-up firms. These firms, if successful, would pay increased rent and rent more space. Since these firms will want to expand nearby, the BRA would assist them in finding new space, either downtown or in EDIC's industrial parks. Although this program would be the most expensive, it could be the most successful by attracting firms with low rents and technical assistance to locate downtown. And since young firms generally expand where they start, blue-collar jobs for Boston's residents would eventually be created.

As noted in the "Availability of Land" section, space for mature and large young firms is scarce except at the South Station development parcel. The next section describes the South Station Air Rights Development Project as well as implementation strategies for these larger firms at South Station.

6.0 SOUTH STATION AIR RIGHTS DEVELOPMENT PROJECT: A Case Study

6.1 The Project

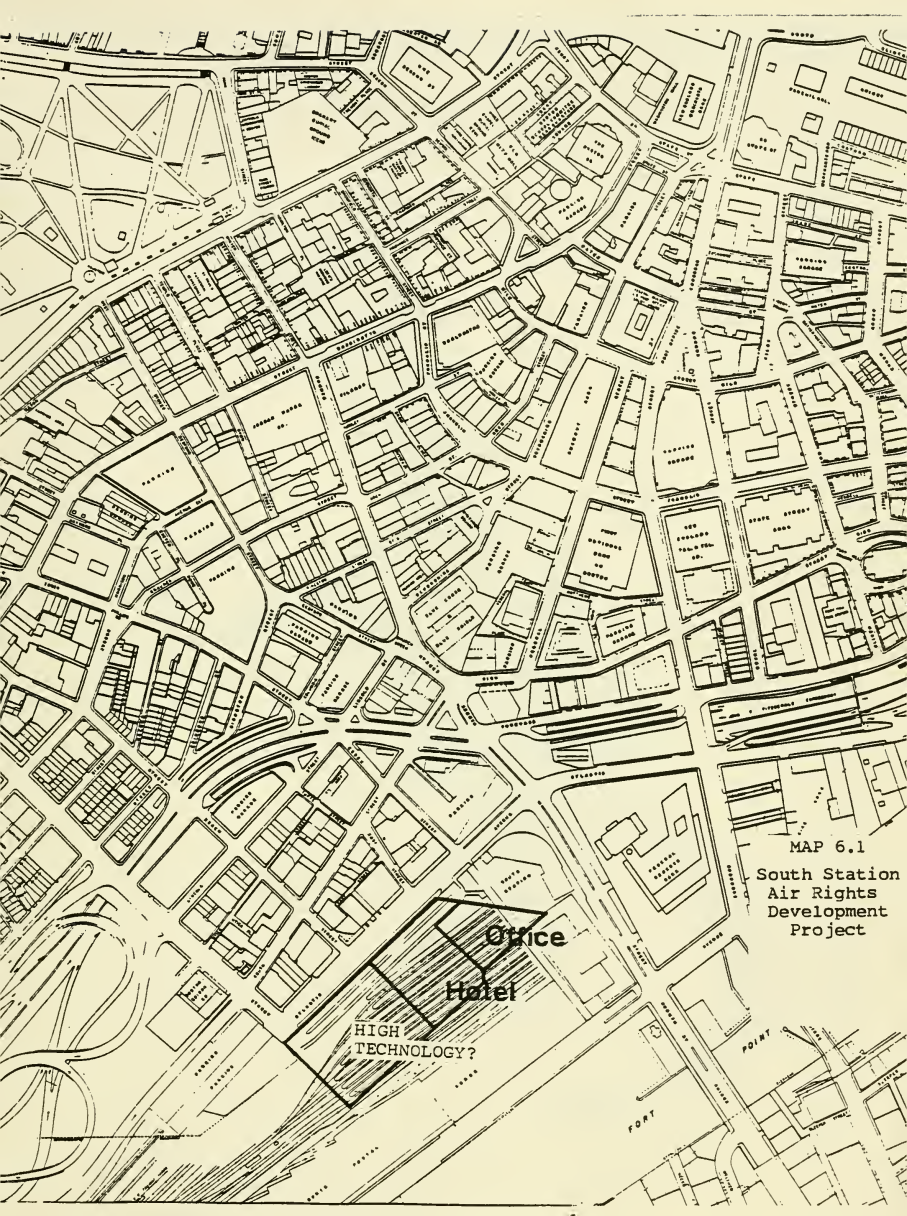
The South Station Air Rights Development Project, a transportation, office, hotel and garage complex, is to be built over tracks feeding into South Station. An additional component, a two-story structure totalling 230,000 net square feet, is now being considered for high technology uses by the BRA. (See Map 6.1 and Diagrams 6.1 and 6.2.)

The transportation component will consist of a renovated South Station Headhouse, a train terminal for AMTRAK, commuter rail, and the MBTA, a bus terminal for Greyhound and Trailways, and 1700 spaces of public parking. The Federal Railway Administration, the Federal Urban Mass Transportation Administration and the MBTA have committed \$80 million to create this transportation center.

Above the transportation center, on BRA-owned air rights, the project will contain three parcels: (1) a 400,000 net square foot 23-story office building; (2) a 600-room, 24-story hotel; and (3) a 230,000 net square foot two-story structure. The BRA has a commitment from EDA to pay for the additional costs of footings and foundations for the two-story structure. Construction for the BRA air-rights portion of the project should begin in early 1983.

Because of the wide interior columns required by the train tracks below, the low-rise parcel was designed as a two-story structure. (On the 7th and 8th floor above ground level, the structure will be above 3 levels of parking and 3 levels of transportation facilities.) Originally designated as a trade center, its proposed uses have changed from arena to convention center site to merchandise mart, and then back to trade center. Because of these intensive uses, pedestrian and large freight elevators with adequate truck access were included in all design plans.

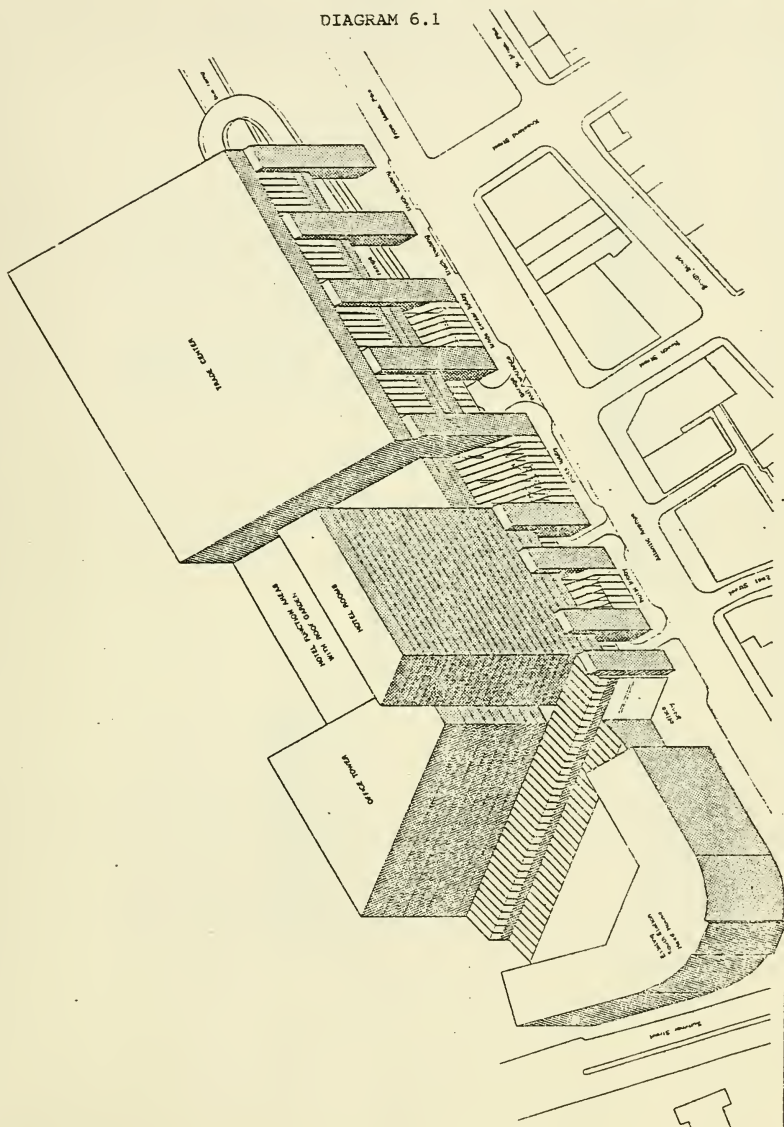
The low-rise parcel will probably be offered to developers using a bidding procedure. Developers would either be the tenants themselves or would have tenants committed to the parcel.



MAP 6.1

South Station
Air Rights
Development
Project

DIAGRAM 6.1



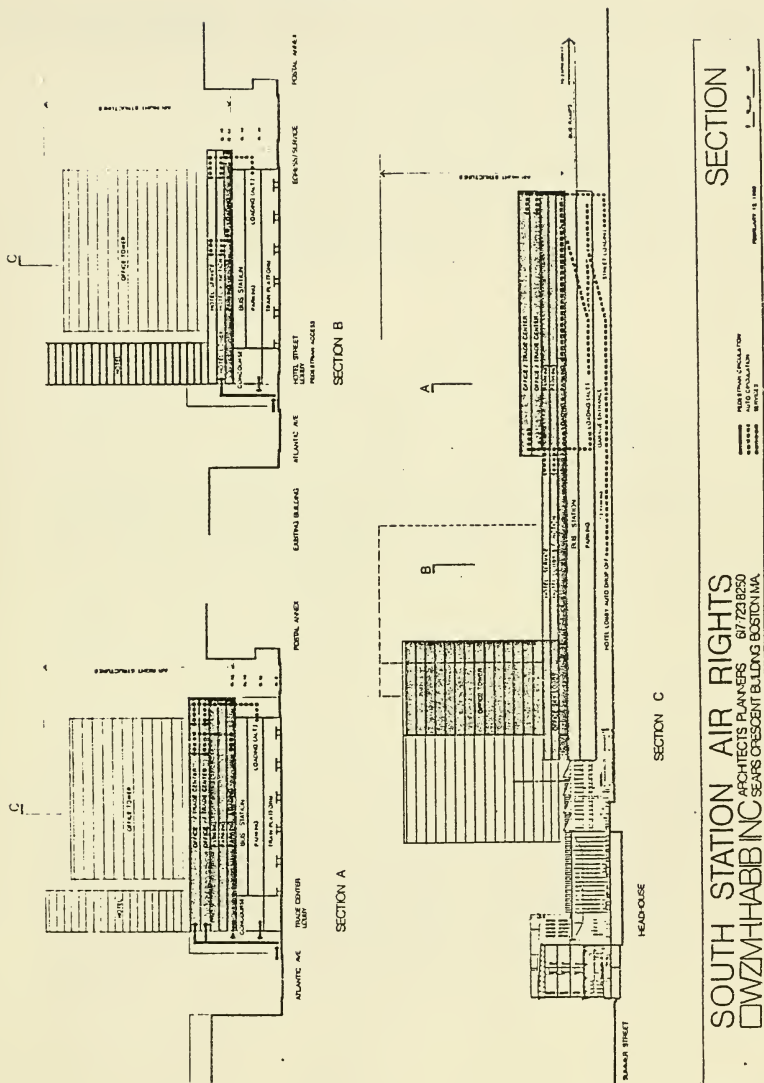
SCHEME
A-1

AXON



SOUTH STATION AIR RIGHTS
ARCHITECTS PLANNERS 57 723 8250
WZM-HABIB INC SEASCRESENT BUILDING BOSTON MA

DIAGRAM 6.2



6.2 Location Theory

In our earlier analysis of a firm's location decision, we described how mature and young firms differ in their decisions. A mature firm would have a number of site alternatives before shopping for government subsidies, while a young firm would have chosen a site before shopping for subsidies. Applying this distinction to the South Station parcel, the BRA could understand a firm's bargaining position before negotiating inducements with potential tenants/developers.

6.2a Young Firms

By early 1983, both Teradyne and Wang would have operating multi-story plants within a few blocks of the South Station parcel. Teradyne would be interested in the parcel to expand its Automatic Test Equipment Division (ATE) based in the Leather District and the South End. Wang would be interested in the parcel to transfer its production facilities from the Boylston Building and to convert the Boylston Building into offices, its intended use.

Teradyne and Wang would not be equally interested in the parcel. Wang's only commitment in Boston is a five-year lease with options to purchase or extend the lease. The Wang production facility in Boston could remain Wang's only entry into Boston; no expansion is required since other new production facilities could be built outside Boston to accommodate increased demands for products produced at the Boylston Building. For Teradyne, however, this parcel may be necessary to maintain close proximity between professional and production staff. By 1985, the Hub Mail Building should be filled to capacity. Teradyne would have the choice of (1) constructing a new facility on the 40,000 square foot parking lot adjacent to the Hub Mail Building; (2) constructing a new facility on the South Station parcel; or (3) looking outside of downtown for new sites. Choice three would be chosen only if Teradyne's ATE Division was mature enough to separate professional staff from production facilities.

Although land in this Central Business District location might privately sell for more than \$12.50/sq.ft., (see Map 6.2 and Table 6.1)²³ the City would receive various benefits from a high technology firm locating at South Station to justify a land cost write-down.

6.4 Benefits to the City

A firm locating at the South Station development site would represent a significant step towards furthering Boston's goals of economic development via job creation. A substantial number of permanent jobs would be created (approximately 1,700) as well as construction jobs (approximately 300). Under a "First Source" agreement, 50% of these jobs would employ Boston residents, including 15% of the jobs to CETA-referred, disadvantaged persons.

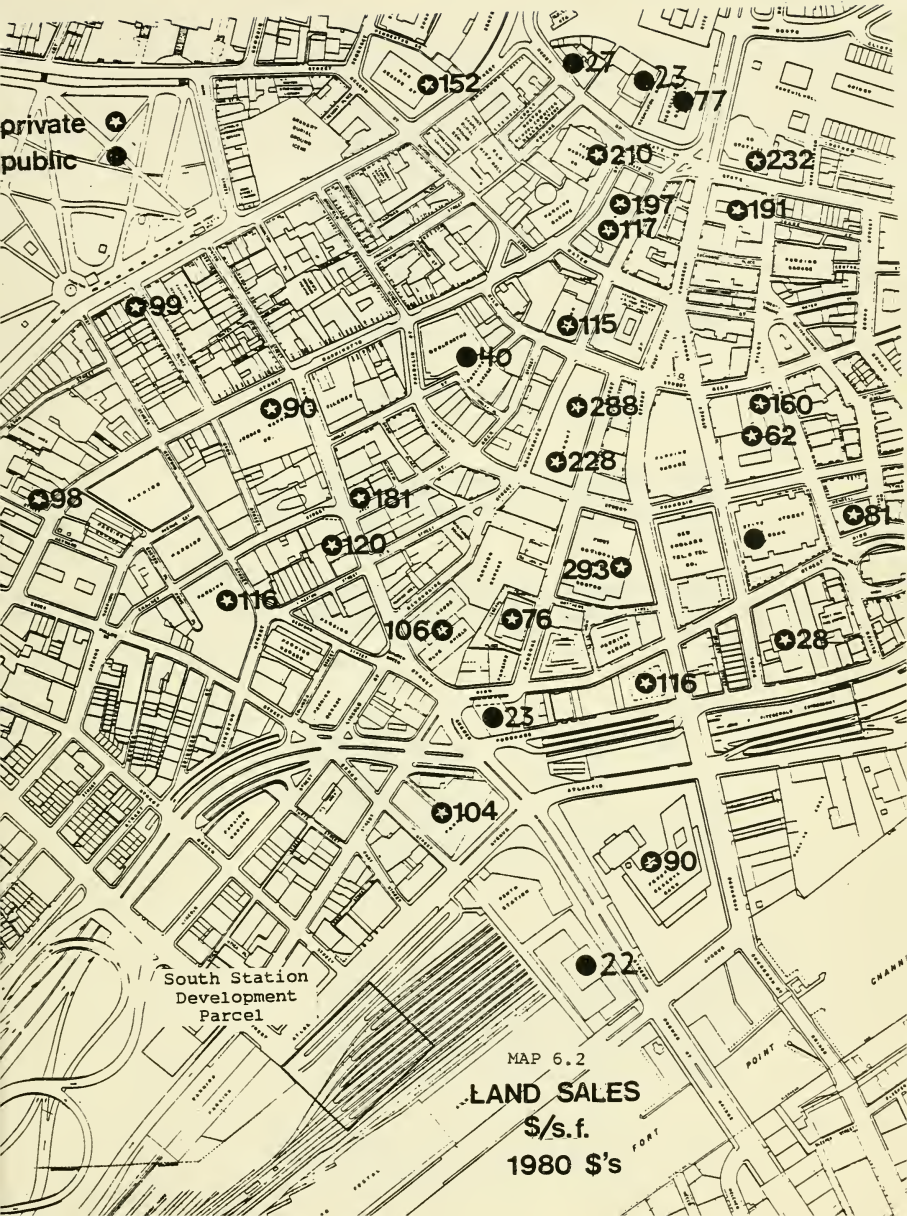
A South Station location would also further the revitalization efforts in this area of the City. The South Station development would complement the accomplished projects of past Teradyne expansion efforts, and the continuing Leather District revitalization. Additionally, the City receives an industry that is an undisruptive land use, as well as a small demander of City services. Although isolated instances exist, high technology is usually environmentally compatible to existing uses: little air, noise or water pollution, and consumes low levels of energy, water, sewerage, fire and police services.

6.5 Implementation

Assuming that the users of the South Station development parcel would be mature firms (and not Teradyne or Wang), the BRA should use an aggressive marketing effort to find those firms best suited for a South Station location. Multiple tenants should be considered a possibility, creating an active industrial park setting.²⁴ Firms could then expand into underutilized space. If more space was unavailable, the BRA would then assist firms to expand to other Boston locations.

To market the parcel, the BRA could use local industrial brokers to locate interested tenants and developers. Developer's kits describing

private
public



South Station
Development
Parcel

MAP 6.2

LAND SALES

\$/s.f.

1980 \$'s

TABLE 6.1

LAND SALES IN FINANCIAL^a AND MIDTOWN DISTRICTS (1956-1980)

Year of Purchase	Address	Buyer/Developer	Sq. Ft.	Price (\$)	Price (\$)/Sq. Ft.	Adjusted ^b Price (\$)/Sq. Ft.	Comments
1956	133 Federal Street	Blue Cross/Blue Shield	19,947	500,000	25.07	76.26	Boston Properties
1957-59	125 High Street	Traveler's Insurance Co.	79,277	775,000	9.76	27.90	State Street Bank
1961-63	225 Franklin Street	Boston British Properties	75,286	1,882,500 ^c	25.00	68.32	One Boston Place
1964-66	201 Washington Street	Cabot, Cabot & Forbes	43,568	3,480,000	79.88	209.29	Part of National Shawmut Bank site
1965	120 Franklin Street	First National Bank of Boston	23,568	2,054,000	87.15	228.34	
1966	100 Federal Street	First National Bank of Boston	81,691	9,394,465	115.00	292.94	
1966	28 State Street	Cabot, Cabot & Forbes	30,429	919,760 ^c	30.23	77.01	N.E. Merchants Bank
1966	228-256 Washington Street	Pagliaro, Jr.	21,193	975,000	46.01	117.19	Devonshire Towers
1967	99 High Street	National Shawmut Bank	56,831	6,600,000	116.13	287.54	
1967	350-370 Washington Street	Daniel Rose	28,676	1,341,667	46.79	115.85	Keystone Building
1968	25 Court Street	Franklin-Washington Redev. Co.	57,987	928,000 ^c	16.00	39.62	Woolworth's & garage
1968	141 Tremont Street	City Bank and Trust	14,400	162,888 ^c	11.31	26.87	Offices
1968	60 State Street	Wasserman	5,407	225,000	41.61	98.87	
1968	200 Boylston Street	Druker	16,032	1,570,000	97.92	232.67	Proposed Four Seasons Hotel
1969	One Beacon Street	Comm. Union Insurance	9,222	200,000 ^c	21.69	51.54	
1969	44-54 South Street & 637-685 Atlantic Avenue	Rose Associates	71,646	4,840,000	67.50	152.20	Proposed Dewey Square Office Building
1969	200 Stuart Street	Howard Johnson's	41,403	1,913,500	46.22	104.22	
1969-70	100 Summer Street	Blue Cross/Blue Shield	72,205	600,000 ^c	8.31	18.74	57 Park Plaza
1970	228-256 Washington Street	Devonshire Associates	64,423	3,203,708	49.73	105.87	Devonshire Towers
1970	573-583 Washington Street	Allright Parking	21,211	1,564,500	92.62	197.19	Parking lot
1970	One Washington Mall	Spaulding, Jr.	15,571	150,000	46.73	98.42	
1971	Summer & Atlantic	Federal Reserve Bank	15,124	186,364 ^c	11.00	23.42	
1971	5-27 Oliver Street & 113-127 Milk Street	Federal Reserve Bank	21,416	9,623,000	44.06	89.94	Part of P.O. Square site
1971	200 Boylston Street	Eastern Gas & Fuel Co.	22,306	1,750,000	78.45	160.13	
1972	Chauncy & Bedford	Boston Edison	33,223	2,000,000	60.20	122.88	Proposed Four Seasons Hotel
1972	62-67 Summer Street & 11-17 Kingston Street	Charlestown Savings Bank	58,087	3,410,000	58.70	115.99	Power plant & lot
			11,146	677,900	60.82	120.18	

TABLE 6.1 cont'd

LAND SALES IN FINANCIAL^a AND MIDTOWN DISTRICTS (1956-1980)

Year of Purchase	Address	Buyer/Developer	Sq. Ft.	Price (\$)	Price (\$)/ Sq. Ft.	Adjusted ^b Price (\$)/ Sq. Ft.	Comments
1973	245 Summer Street	Stone and Webster	81,958	11.71	21.78		
1973	53 State Street	Old State Trust	48,464	103.16	191.90		Olympia Tower
1973-74	Summer & Arch	Union Warren Bank	6,355	108.00	181.05		
1974	27 Summer St., 42 Avon St., 9-23 Chauncy Street	Alstores, Inc.	34,446	54.25	90.94		Sale of Jordan Marsh ground lease.
1975	175 Federal Street	Beacon Companies	19,087	14.76	22.67		Fiduciary trust
1978	One Post Office Square	Beacon Companies	77,791	48.84	61.89		
1980	156 High Street	BOMI Realty	12,346	81.00	---		Possible office site
1980	50 Milk Street	Elder Associates	17,336	115.37	---		

a. Excluding land sales in Custom House District.

b. Price/square foot is adjusted to 1980 dollars by using the Consumer Price Index listing as of June 1980. Purchases over a three year period are adjusted from the middle year. Purchases over a two year period are adjusted from the second year.

c. Purchase or partial purchase from public agency.

design requirements, appropriate tenants and bid guidelines would be given to brokers, tenants and developers. The BRA would evaluate proposals for tenant mix, employment characteristics, as well as sale or lease prices and tenant/developer financial capabilities.

7.0 INTERVIEWS

In preparing this paper, we have talked to many people that plan, build, market and operate high technology facilities. In the following section, we summarize the main points of these interviews. After that section, we have included the details of 5 interviews with property managers.

7.1 Summary

Location Theory

Young firms have a tendency to keep their production and professional staff together, allowing for constant improvements and supervision of new product lines. Although different divisions of a company can be located elsewhere, facilities of the same division will be located within the same industrial park, neighborhood or building. Once a division of a firm has stable product lines, production facilities can be located close to markets.

Land

Good suburban sites are becoming scarce, making good downtown sites more attractive. But bad downtown sites, i.e., small parcels, poor access, will not become marketable even with great labor pools.

Buildings

Many firms could go vertical if necessary, but cheap land has allowed firms to build one-story facilities. One-story facilities do have a better flow of production for most companies, although the additional cost of production in multi-story buildings is not large.

Labor

Although some firms are having problems with staffing, the problems are primarily with production workers. Firms are moving production facilities to areas with housewife and employable populations.

Firms get their engineers from Northeastern and Boston Universities and their research staff from Harvard and MIT. Students from all schools drive to suburban locations to work part-time for firms.

Transportation (Workers)

Firms at downtown locations will provide shuttle buses to and from transit stops rather than build more parking.

Transportation (Products)

Although all firms agree that good access to interstates and airports is crucial, they disagree about the difference in cost between downtown and suburban locations. Some firms use UPS, some use sea transport. Truck access to plant freight elevators is crucial.

Innovation, Services, Amenities

Although firms get students to drive to suburban locations, it may be that firms closer to these schools can use students more effectively. Also a downtown location may be best for a firm's educational facilities for engineers coming to Boston to learn about a firm's products.

Downtown services, such as restaurants, banks, and lawyers may be important for top management, but not for professional and production staff. Many firms, even downtown ones, build expensive cafeterias for their workers.

Implementation

Firms want Boston's image, without Boston's problems. A promotion effort should focus on other Boston attractions besides image. High technology service firms from out of state want to locate in the area and Boston should be promoted as a central location to all the area's firms.

7.2 Detailed Interviews

Firm: ANALOG DEVICES, INC.
Property Manager: Clint Beaven
Firm's Headquarters: Norwood
Date of Interview: 12/80

- o Analog Devices started in Cambridge, moved for more space.
- o 5 plants in Wilmington, Wakefield, Burlington and Norwood, total square feet equals 700,000.
- o largest plant is 140,000 sq.ft., 1-story.
- o since firm is still young and product lines grow fast, each plant contains one division with production and R&D together.
- o products are small electronics and are easily transported; could be in vertical building since all assembly can be done on one floor.
- o Beaven didn't think there would be any problem with vertical buildings unless products had large frame construction.
- o crime is a big problem for a downtown location (Beaven used to work at Gillette's South Boston plant on Ft. Point Channel).
- o production worker access is good to downtown Boston.
- o professionals don't like traffic, parking and crime problems of downtown.
- o Analog's staff: 20-25%: R&D
20-25%: middle level engineers
35-40%: production workers.

- o production workers are generally young singles or housewives.
- o second shift from 4:00 pm to midnight with housewife shift from 4:00 pm to 8:00 pm.
- o difficult to staff second shift since they are running out of housewives and young mid-level engineers don't want to work second shifts. (Maybe easier to get them in Boston on a second shift).
- o Analog asks young engineers to go to graduate school at Northeastern Suburban campus and Worcester Polytechnical; engineers originally went to BU and Northeastern.
- o R&D professionals are generally Harvard & MIT graduates; some Harvard and MIT graduate students work at Analog and drive to work.
- o transportation of finished products is no different between suburbs and city; both sites use truck and plane transport.

Firm: CODEX, INC.
Property Manager: Ronald Lind
Firm's Headquarters: Mansfield
Date of Interview: 12/80

- o production process is an electronics process with flow of production towards shipping area; all on one floor.
- o 4 plants on 50 acres purchased 5½ years ago; all plants are one story except two-story corporate headquarters that also has R&D; footprints range from 120,000 sq.ft. to 164,000 sq.ft.
- o no reason why not more than one story.
- o staff: R&D: 20%
mid level engineers: 20%
production: 60%
- o many of R&D and engineers from Newton area.
- o most of production workers are from Mansfield area; small 2nd housewife shift.
- o new corporate headquarters in Canton on Prowse Farm (zoning controversy) with 200,000 sq.ft. footprint; 54 acres for \$1 million or \$18,500 an acre/\$0.42 @ sq.ft. for unimproved land.
- o moving corporate headquarters to Canton to get closer to Boston and use Boston image.

- o distance to Mansfield is a problem for visitors, especially engineers from purchasing companies who come to Codex's education center to learn products; engineers learn for a few days to a week and stay at suburban hotels.
- o no problem with staffing workers.
- o South Station or downtown location is no problem for professional staff since the commute will be the same, but production workers couldn't be transferred since they live near Mansfield; entirely new production staff needed for downtown move.

Firm: NEW ENGLAND NUCLEAR, INC.
Property Manager: Fred Garrett
Firm's Headquarters: Boston
Date of Interview: 12/80

- o company manufactures radioisotopes for hospital and educational use (50% of world market).
- o located in South End Industrial Corridor on Albany Street.
- o also, a Billerica plant which comprises a different division than the Boston plant.
- o 25% growth, \$82 million in sales in 1980.
- o 80% of products from Boston plant are shipped to hospitals and schools in Boston area.
- o products from Billerica plant are generally shipped from Logan or Hanscom AFB.
- o Boston buildings are two story pillboxes with large load bearing construction.
- o NEN has parking and expansion problems; proposes to build two 60,000 sq.ft., 2½-story buildings with parking below on adjacent parcels.
- o firm has shuttle service that brings workers to MBTA's Orange Line.
- o Billerica's taxes are \$.86/sq.ft., Boston's taxes are \$.22/sq.ft.
- o building new plant in Newton with IDB financing.

Firm: FOXBORO COMPANY, INC.
Property Manager: Sam Siegler
Firm's Headquarters: Foxboro
Date of Interview: 12/80

- o Foxboro Co. located in Foxboro, Brockton, and Bridgewater.
- o original site in Foxboro was 69 acres.
- o East Bridgewater site has 120 acres.
- o firm is 75 years old and looking beyond New England for its future production expansion.
- o started in three-story old manufacturing plant where firm first manufactured large machinery; moving machines got cumbersome so production was transferred to new one story plant with offices for sales, administration, etc., remaining in three story plant.
- o one story best for product flow; firm has large products (300-400 sq.ft.) and small products.
- o small products made with 50 ton machines so one story best, but no reason why three story building isn't alright for certain products.
- o products transported by truck, ship or plane; by ship if large product or if air facility receiving product is poor.
- o production facilities will be going international to follow market.
- o education seminars given in Foxboro and Houston to purchasing engineers or for engineering, professional organizations.
- o sales and service centers will also be moving into other markets.
- o R&D sections will spread out across country since Harvard and MIT don't have a monopoly on ideas; other good engineering schools.
- o R&D will become smaller percentage of workforce in future.
- o Staff: 30%: R&D/engineers
70%: production.
- o starting to get difficult to find new production workers so have moved to Brockton for female worker population.
- o females are used for assembly production.
- o males used for large machinery.

- o 3 shifts in E. Bridgewater, with some housewives, and 2 shifts in Foxboro, but no housewives since large machinery.
- o students from Northeastern University co-op used.
- o companies would go to South Station development parcel if right product, but would probably be better for R&D part of a firm.
- o service companies from outside New England are trying to find space near Boston to get closer to their companies.
- o company with suburbanite mentality could be convinced about downtown with right factors.

Firm: ORION RESEARCH, INC.
Property Manager: Jim Piro
Firm's Headquarters: Cambridge
Date of Interview: 12/80

- o reason for Orion starting and staying in Cambridge is that owner lives in Cambridge.
- o started out on Putnam Avenue in Cambridgeport and planned to consolidate at 840 Memorial Drive on old Riverside Press site.
- o originally planned to put production in 840, but when building completed there wasn't enough space; Orion leases on Cambridge Parkway near Sonesta Hotel.
- o 840 now has corporate headquarters, R&D and some engineers; totalling 100 workers.
- o 50% of 840's employees use garage in building.
- o Orion leases remainder of 840 for office space at \$13.50/sq.ft.
- o 100,000 additional square feet will be needed by 1985; some expansion room available, but doesn't know where they'll go next.
- o 25% growth; company makes small analytical meters; clean production process.
- o transports product by UPS or truck.
- o Cambridge Parkway plant has three floors; second floor used as production floor (35,000 sq.ft.) with first and third used for storing materials.
- o production floor in Cambridge Parkway requisitions materials which arrive by elevator from first and third floors.

- o Orion would prefer one story as more cost effective, but prices are lowered anyway because of productivity increases to stay with competition.
- o downtown, Fort Point Channel site is fine, especially if one-floor production and storage.
- o professional workers commute from out of town; production workers live in neighborhood.

APPENDIX I

A DEFINITION OF "HIGH TECHNOLOGY"

Available literature agrees that a definition for high technology industry is elusive. It is most often thought of as synonymous with the electronics industry but, in reality, encompasses a far broader range of industries. Spanning both the manufacturing and non-manufacturing sectors and durable and non-durable goods, "high tech" can be thought of as a separate industrial sector.

The Division of Employment Security has come up with a "list of 20", a list of industries defined as high technology "on the basis of the perceived degree of technical sophistication for the products produced by the industry." Some experts have come to feel, however, that this classification is too subjective to be of much use. In a recent report on high technology industries in Massachusetts, the Commonwealth's Department of Manpower Development (DMD) expressed the view that a more complete definition of this industrial sector should look at "factor inputs" necessary to produce the good or service. Specifically, the DMD based its definition of high technology industries on the percentage of engineers, scientists, and technicians in the industry workforce.

Following this guideline, the DMD examined two-digit Standard Industrial Classification (SIC) manufacturing industries in Massachusetts and determined the percent of engineers, scientists, and technicians in each, as shown in Table A-1. Industries with percentages lower than 8.4%, the manufacturing average, were removed from further consideration. In a second step, the DMD looked at the industries at the three-digit level. Those with percentages of engineers, scientists, and technicians greater than 13.7%, the percent for all durable goods, were defined as high technology industries as shown in Table A.2. (The DMD did acknowledge that the 13.7% figure is subjective but feels that since so many of the high percentage industries produce durable goods, it serves as a good cut-off point.)

The DMD also compared three-digit SIC non-manufacturing industries with the 13.7% figure. The results, as seen in Table A.3 show very high percentages of engineers, scientists, and technicians in five of these industries, including computer programming services and commercial research and development. These five non-manufacturing industries plus the 15 manufacturing industries previously defined are high technology industry in Massachusetts.

To generalize from this information, the high technology sector in Massachusetts is comprised of a broad spectrum of technology-intensive industries as reflected by the high percentage of engineers, scientists, and technicians they employ. Further, they can not be classified according to product since their products are so different - a range that includes chemicals and plastics, computer programs, and guided missiles. In addition, high technology industries in Massachusetts are characterized by rapid growth. In the period 1976 (fourth quarter) to 1978 (fourth quarter) alone, "high tech" employment in Massachusetts grew by 47,527 jobs, 23.3% of the total employment increase in the Commonwealth in that period. It should also be mentioned that industries of "low" or "medium technology" may have "pockets of specialized expertise" which have characteristics of the high technology industries.

TABLE I.A

Estimated Shares of Engineers, Scientists and Technicians Among Two
Digit SIC Manufacturing Industries in Massachusetts

<u>Standard Industrial Classification (SIC)</u>	<u>Industry Title</u>	<u>Industry Employment</u>	<u>Number of Engineers, Scientists Technicians</u>	<u>Percentage of Engineer Scientists, and Tech- nicians</u>
<u>Non-Durable Goods</u>				
20	Food Products	29,540	480	1.6
22	Textile Products	27,700	940	3.4
23*	Apparel Products	45,040	230	0.5
26	Paper Products	29,380	1,020	3.5
27*	Printing Products	42,060	620	1.5
28*	Chemical Products	19,150	2,110	11.0
30*	Rubber Products	35,850	1,150	3.2
31	Leather Products	23,450	230	1.0
Non-Durable Total		252,170	6,780	2.7
<u>Durable Goods</u>				
24 ¹	Lumber Products	1,040	40	3.8
25	Furniture	8,310	80	1.0
32 ²	Stone, Glass, Clay	11,220	670	6.0
33	Primary Metals	3,840	50	1.3
34	Fabricated Metals	51,310	3,510	6.8
35*	Machinery	79,370	9,330	11.8
36 ³	Electrical Machinery	81,150	13,800	17.0
37	Transportation Equip	15,470	2,410	15.6
38	Instruments	50,820	11,430	22.5
Durable Goods Total		302,530	41,320	13.7
39	Miscellaneous Manufacturing	25,210	610	2.4
Total Manufacturing		579,910	46,710	8.4

Notes

* employment estimates obtained from 1974 Occupational Profile of Selected Manufacturing Industries in Massachusetts

¹ estimates obtained only for SIC 243-millwork, plywood and related products

² estimates obtained only for SIC 332 - iron and steel foundries and 336 - non-ferrous foundries

³ estimates obtained only for SIC 371 - motor vehicles and equipment, SIC 372 - aircraft and parts and SIC 373 - ship and boat building

SOURCE: DMD, Defining "High Technology" Industries in Massachusetts,
September, 1979.

TABLE I.B

1974 and 1977 OES Industry And Occupational Employment Estimates Among
Those Manufacturing Industries Classified in Massachusetts As High
Technology

<u>3 Digit SIC</u>	<u>Industry Title</u>	<u>Industry Employment</u>	<u>Number of Engineers, Scientists & Technicians</u>	<u>Percentage of Industrial Employment</u>
281*	Industrial Chemicals	1,540	210	13.7
282*	Plastic Materials	7,330	1,000	13.7
283	Drugs	1,780	310	17.5
351	Engines and Turbines	6,280	1,170	18.6
357	Office and Computing Machines Machines	23,120	6,900	29.3
361	Electrical Distribution Equipment	19,330	4,350	22.5
362*	Electrical Industrial Apparatus	2,620	370	14.1
366	Communication Equipment	24,790	7,490	30.2
367	Electronic Components	35,720	6,650	18.6
372	Aircraft and Parts	8,380	2,170	25.9
376	Space Vehicles and Guided Missles	11,770	Not Available	
381*	Engineering and Scientific Instruments	2,770	750	27.0
382	Measuring and Conrolling Instruments	16,670	4,280	25.0
383*	Optical Instruments	3,890	1,310	33.6
386	Photographic Equipment and Supplies	13,250	3,390	25.6

* 1974 OES survey estimates

SOURCE: DMD, Defining "High Technology" Industries in Massachusetts,
September, 1979.

TABLE I.C

Estimated Shares of Engineers, Scientists and Technicians Among
Non-Manufacturing Industries in Massachusetts Classified as High
Technology

<u>SIC</u>	<u>Industry Title</u>	<u>Share of Total Employment Accounted for by Engineers, Scientists and Technicians</u>
737	Computer Programming Services	38.8
7391, 7397	Commercial Research & Development Lab	40.5
7392	Business Management and Consulting Services	20.0
891	Engineering and Architecture Services	48.5
892	Non Profit, Educational, Scientific, and Research Organizations	17.3

Source: 1974 Census-Based Industry-Occupation Matrix

SOURCE: DMD, Defining "High Technology" Industries in Massachusetts,
September, 1979.

APPENDIX II

PUBLIC SECTOR TOOLS

1. Proposed Revenue Bond Power

Currently, the BRA can not issue revenue bonds backed by the full faith and credit of the City. Although amendments to the BRA enabling statute passed both houses of the General Court, it was "mistakenly" vetoed by the Governor. This power would permit the BRA to use proceeds from bond issuances for purchasing land and constructing or renovating buildings. EDIC/Boston has this power today.

2. Urban Development Action Grants (UDAG)

The program was started in 1978 under the Community Development Act of 1977 and is primarily geared towards large metropolitan cities. In the last two years since its inception, \$1.1 billion has been awarded to 594 projects, leveraging \$6 billion in private investment. The key strengths to the program are that the program is much simpler and quicker than other Federal urban programs and that grants give cities a means of competing with the suburbs. The UDAG application requires a firm commitment from a private firm to finance a specific project. Boston UDAG's are listed on Table II.A.

UDAG's are also used by firms to increase their IRS-permitted level of capital expenditures, within a jurisdiction during a six year period, from \$10 million to \$20 million. Of 600 UDAGs to date, 100 to 150 involved IDB financing.

3. Industrial Development Bonds (IDBs)

IDB's are business loans that receive a tax exemption on the loan's interest. Lenders or bond holders will, therefore, grant loans at lower interest rates. The IDB is secured by a first lien on property or by a property's or firm's income stream.

TABLE II. A
BOSTON URBAN DEVELOPMENT ACTION GRANTS

<u>Project</u>	<u>UDAG \$ (000)</u>	<u>Private \$ (000)</u>	<u>Private/ UDAG</u>	<u>Public \$ (000)</u>	<u>Permanent Jobs</u>	<u>Job/ UDAG \$</u>
Lafayette Place	8,000	42,850	5.4	15,570	796	10,050
Charlestown Navy Yard	2,480	17,600	7.1	500	32	77,500
Blue Hill Avenue	1,800	6,600	3.7	--	334	5,389
Crosstown Ind. Park/Healthco	449	585	0.3	1,675 (\$5m EDIC Industrial Bond issue, in addition)	200	4,803
Teradyne	7,300	80,000	11.4		2,000	3,650

IDB's were initially used by southern states to attract industry with tax exempt financing. Commonly, the state or locality would issue a general obligation or revenue bond to build an industrial plant, which was then leased to a firm. Congress perceived that IDBs were being misused and withdrew the tax exemption for interest. There are limited exceptions:

- (a) IDB's can be issued without restriction for capital expenditures of less than \$1 million;
- (b) IDB's can be issued for capital expenditures of more than \$1 million, but less than \$10,000,000, if
 - (i) the firm has not incurred capital expenditures within that government jurisdiction of more than \$10,000,000;
 - (ii) the firm has not incurred capital expenditures during a six year period (three years before and three years after) of more than \$10,000,000;
- (c) If a firm receives a UDAG award for certain capital expenditures, then the \$10 million capital expenditure limit is increased to \$20 million. However, the \$10 million limit on IDB's remains.

IDB's can affect the size of plants for firms eager to qualify for IDB financing and its lower interest rate (generally, 67% of prime or 55% of prime plus two points). Table II.B shows that the savings can be substantial.

IDB's will only effect the location of plants among nearby communities after a firm has made a Stage One location decision. For example, a firm based in Framingham, with capital expenditures within a six year period above the \$10 million limitation, may build a plant on the Natick side of the Framingham-Natick border.

TABLE II.B
SAVINGS FROM INDUSTRIAL DEVELOPMENT BONDS

ASSUMPTIONS

1. \$10 million capital expenditure--
 - \$5 million for land and building amortized over 25 years
 - \$5 million for equipment amortized over 17 years
2. IDB mortgage rate = 10.25%
3. Prime Rate = 15%
4. Debt Service constants (monthly compounded)
 - 15% for 25 years K=.15372
 - 15% for 17 years K=.16296
 - 10.25%/25 years K=.11112
 - 10.25%/17 years K=.12444

CALCULATIONS

	<u>Market</u>	<u>IDB</u>	<u>Difference</u>
a. \$5m. for land + building	\$ 768,600	\$ 555,600	\$ 213,000
b. \$5m. for equipment	<u>814,800</u>	<u>622,200</u>	<u>192,600</u>
TOTALS	\$ 1,583,400	\$1,177,800	\$ 405,600
a. Debt Service (25 years) x PV 12% Annuity Multiplier	\$ 768,600 <u>7.842</u>	\$ 555,600 <u>7.842</u>	
	\$ 6,027,361	\$4,357,015	\$1,670,346
b. Debt Service (17 years) x PV 12% Annuity Multiplier	\$ 814,800 <u>7.119</u>	\$ 622,200 <u>7.119</u>	
	\$ 5,800,561	\$4,429,441	\$1,371,119
TOTALS	\$11,827,922	\$8,786,457	\$3,041,465

4. Zoning

In the City of Boston, three entities are involved in zoning decisions, the BRA Zoning staff, the Zoning Commission and the Zoning Board of Appeal. The Zoning staff reviews and makes recommendations for zoning map and text changes to the Zoning Commission and for variances and exceptions to the Board of Appeal. Sixty amendments to the map and text of the Zoning Code have been made since 1964. Of late, BRA recommendations to the Zoning Commission and Board of Appeal have generally been followed.

5. Chapter 121A Developments

The BRA can ensure a stable tax level for commercial, residential and industrial development. A developer will form a non-profit 121A corporation to receive a tax exemption for periods from 15 to 40 years. In return for this exemption, the corporation agrees to pay to the City a percentage (generally 20-25%) of gross revenues. A 121A development benefits from stable and slightly lower taxes, but must agree to give preference in hiring Boston residents and to follow equal employment opportunity rules. The majority of 121A developments have been residential because of the non-profit corporation requirement. Teradyne and the Prudential Center are exceptions.

Development using the 121A tax agreement have contributed to approximately \$½ billion in economic development, in over 100 separate awards, through personal and real property tax exemptions for firms. Though popular and extensively used, the 121A tax incentive tool appears to be declining in use. City officials are becoming hesitant to forego vital tax revenue. For example, property tax rollbacks cost Massachusetts \$25 million in 1975. Thus, the City has had a greater incentive to accurately evaluate the 121A, rather than erroneously perceive this tool to be cost-free. Additionally, the relative importance of taxes in the location decision has been increasingly open to question. Although industry members claim that taxes are a crucial element in their decision process, this may not be accurately represented. Clearly, the value of a 121A agreement has to be closely scrutinized as to its true value as a job creation incentive.

APPENDIX III

EMPLOYMENT CHARACTERISTICS

In the last 25 years, Boston has lost jobs and population. Although growth in service sector jobs have increased the number of jobs in Boston, Boston residents are capturing a decreasing proportion of these jobs, from 48% in 1960 to 38% in 1977.

Although Boston's unemployment rate of 5.7% (Spring 1980) is lower than the national average, various sections of the population have much higher rates.

UNEMPLOYMENT RATE IN BOSTON, SPRING 1980

<u>Age</u>	<u>Sex</u>		<u>Race</u>		<u>All Persons</u>
	<u>Male</u>	<u>Female</u>	<u>White</u>	<u>Minority</u>	
16-19 years	18	6	9	12	12
20-24	10	15	7	27	12
Total Population (16 years & older)	5	6	4	9	5.7

Source: Characteristics of Boston's Population and Housing, Nov. 1980, BRA Research Department, Table D-4.

The South End, which has a 60% minority population (25% Black, 14% Hispanic, and 21% Oriental), shares the highest unemployment rate of 9% (Spring 1980) with Jamaica Plain/Parker Hill and Mattapan. Source: Ibid, Table D-5.

Other data, available for occupation of residents by race, shows that minorities have a lower than average share of professional/managerial/technical jobs, but a higher than average share of service worker and operative jobs.

<u>Occupation</u>	<u>White</u>	<u>Black</u>	<u>Hispanic</u>	<u>Oriental</u>	<u>All</u>
Professional/Managerial/Technical	35%	15%	14%	16%	30%
Operatives	8	17	16	16	10
Service Workers	16	25	47	39	19

Source: Ibid, Table E-1.

In Chinatown, with approximately 5,000 residents, unemployment is nearly 13%. There is also a very high percentage of ^{der}unemployment with 77% of the working male population employed in restaurant activities and 73% of females employed in the garment district on the edge of Chinatown. Source: Teradyne UDAG Application, 1980.

APPENDIX IV

TERADYNE'S WORKER PROFILE

As of March 1980, the worker profile was as follows:

<u>Salary Grouping</u>	<u>Number</u>	<u>Average Salary</u>
\$10,000 or less	377 (27.2%)	\$ 8,586
\$10,000 - \$15,000	376 (27.2%)	11,889
\$15,000 or more	<u>631 (45.6%)</u>	<u>27,700</u>
TOTALS:	1,384 (100%)	AVG. \$18,200

17.4% of Teradyne's employees in Boston are minorities and 36% are women. 32% of employees are Boston residents. Minority employees have an average salary of \$11,324.

Of the 2,000 jobs to be created by the UDAG projects, Teradyne has agreed to hire 1,000 Boston residents, of which 22.5% will be resident minorities. 125 non-resident minorities will also be hired.

Source: Teradyne UDAG Application, City of Boston, 1980.

APPENDIX V

EXAMPLES OF LIMITED SEARCH STRATEGIES: WANG, TERADYNE, ORION

Wang Laboratories is one of the fastest growing established high technology companies in Massachusetts. Thirty years ago, its first location was in Tewksbury, in Northern Middlesex County. The firm has since moved its corporate headquarters to Lowell, a distance of 5 miles. Almost all of its plants are in Northern Middlesex County. Although its expansion to downtown Boston is driven by social responsibility reasons, the assembly work will probably be from a division with an established product line little professional assistance.

Teradyne started in 1960 on Summer and Kingston Streets in downtown Boston. Outgrowing its space, it moved to Boston's Leather District. Including its expansion to the Hub Mail Building, 87% of space allocated to Teradyne's Automatic Test Equipment Division is in three buildings in downtown Boston.

Orion, a Cambridge high technology firm, grew in the Cambridgeport section of Cambridge on Blackstone Street and Putnam Avenue. Its plans were to consolidate all professional and production operations into one building on Memorial Drive next to Blackstone Street. When the new building was completed the firm's production operations would not fit. Space was leased on Cambridge Parkway near Lechmere.

FOOTNOTES

1. See Appendix I for a definition of "high technology."
2. Teradyne: Urban Development Action Grant Application, City of Boston, 1980, pp. 7, 8.
3. See Appendix III for detailed employment characteristics of Boston.
4. "The Boylston Building," Chinese Economic Development Council, November 1980.
5. Teradyne: UDAG Application; Teradyne, Inc., Annual Report. 1979. For information on Teradyne's worker profile, see Appendix IV.
6. Although Birch generally uses the terms 'young' and 'mature' to describe a firm by its number of employees, we will use the terms to describe the stability of product lines. Mature firms will have established product lines and the ability to separate professional staff from production plants, while young firms have rapidly changing and growing product lines and need to keep professional staff working with the production process.
7. Worker density, parking space footage, construction costs derived from Teradyne: UDAG Application. Parking costs from Jim Boulger, BRA Chief Inspecting Architect. Mr. Boulger also confirmed construction costs.
8. Example derived from Teradyne: UDAG Application, pp. 37,38. City total excludes land purchased for expansion that was included in the application's example. Building and land acquisition costs have been calculated (in the application) by using the present value of lease payments. Renovation costs equal \$38.07/sq.ft., while the suburban example uses development costs of \$39.72/sq.ft.
9. "Site Prices Low, Construction Prices High," Boston Globe, July 27, 1980.
10. The BRA's Charlestown Navy Yard Redevelopment and its high technology potential is intentionally excluded from this paper.
11. These advantages include easier transportation access for products and employees, closeness to services, downtown amenities and innovations from Harvard and MIT.
12. We also suggest that the BRA re-evaluate its policy of encouraging large commercial developments in the Fort Point Channel Area in the future. Although race problems may prevent minority workers from working in the Channel Area since it is considered part of South Boston, the area's large, vacant parcels would be prime expansion space for Teradyne, Wang, and the users of the South Station parcel.

13. Some firms believe that for certain workers, such as young engineers, the labor pool in downtown Boston would be superior to the suburbs. See Analog Devices Interview, p. 34.
14. Including business school graduates from Harvard and MIT for sales, finances, and general management positions.
15. LeCam, Christine, Commonwealth of Massachusetts, Department of Manpower Development, Policy and Evaluation Division, The Public Vocational Education System as a Potential Source of Labor Supply to Selected High Technology Occupations, Boston, Massachusetts, June 1980, p.10.
16. Ibid, p.14.
17. See Employment Characteristics, Appendix III.
18. See Foxboro Co. Interview, p.37.
19. "Part of our operation could go out of this state, but some lines need constant engineering and we are near Harvard and MIT, which has a continous source of information for our people. If Harvard and MIT weren't here, we wouldn't be here either." Sam Siegler, Foxboro Co., quoted in "Computer a Multi-Billion Dollar Business". Killam, Herald American Supplement, 10/21/80.
20. Or other Federal grant programs, such as EDA grants under its various title programs.
21. We are not suggesting that the BRA disregard the needs of Teradyne and Wang. The BRA, however, should not be held hostage to their wishes. Expansion space would be available for them at EDIC's industrial parks or the Fort Point Channel Area, if needed.
22. Jim Boulger, BRA.
23. No land sales have occurred in the Leather District immediately adjacent to the development parcel. Although private land sales around \$100/sq.ft. have occurred close to the South Station Headhouse, they are some distance from the location of the development parcel, as well as closer to the Financial District. Note that public land sales in the \$22-\$23/sq.ft. range have occurred in the South Station area.
24. This would require that at least four separate elevator banks and four separate truck loading docks be designed.

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